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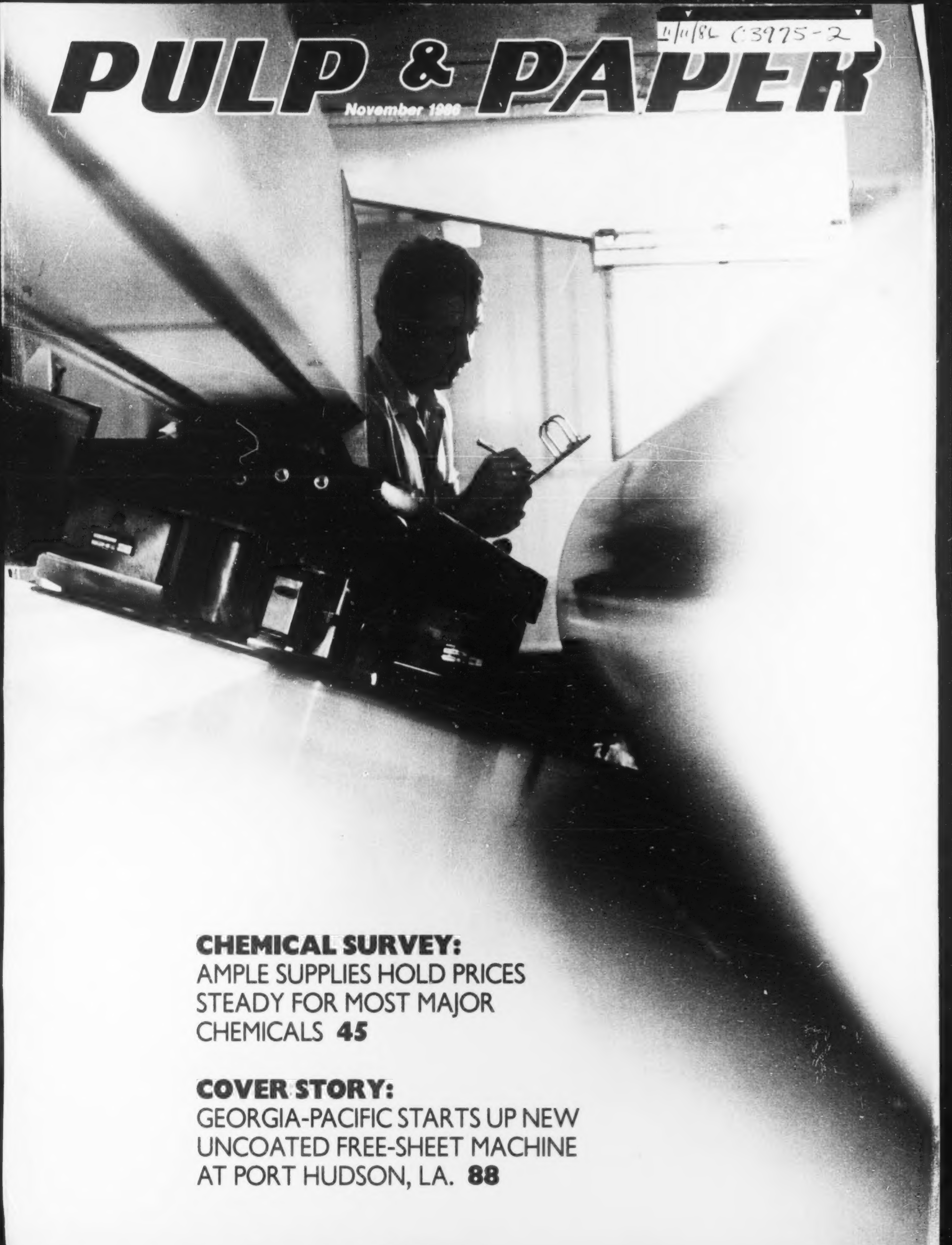
PULP & PAPER

November 1986



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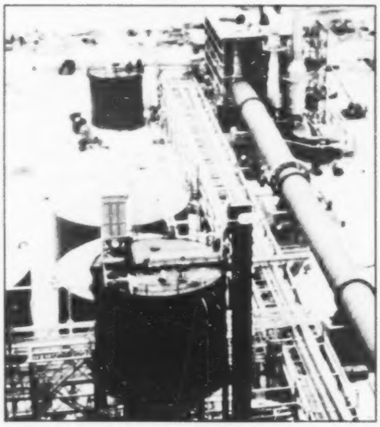

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PULP & PAPER (ISSN 0033-4081) is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $50.00 a year in the U.S. All subscriptions to other countries: $70.00 a year, except Europe and Mediterranean, $86.00 (air service included). Single copy, $4.50, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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Send subscription correspondence to:
Circulation Department, PULP & PAPER,
500 Howard St., San Francisco, Calif. 94105.
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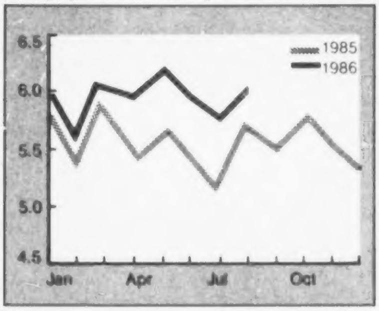
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.03 million tons in August, up 4.5% from the same month last year, according to American Paper Institute data. Production continued at a record pace about 2.6% above the previous high, set in 1984, and 5.1% higher than last year. The 1986 trend position for the month stood at 70.6 million tpy—the fourth straight month above 70 million tpy. The bulk of the gains are in the paperboard sector, where production is running 7.2% ahead of last year. Paper production is up 3.0% from 1985.

Among major grades, containerboard production continued at record levels, with inventories at box plants down 15.3% at the beginning of August and exports of kraft linerboard up 25.6% over last year. Strong demand pushed bleached board up 7.9% and recycled up 7.5% compared with last year. Uncoated free-sheet led the gains in the paper sector, while coated papers continued to recover, rising 14.9% for the month. Tissue and newsprint both continued about 2.6% over last year's levels.

Canadian newsprint shipments rose 5.5% in August to 790,000 tons, while pulp exports jumped 12.5%, to 656,000 tons. Operating rates were 93% for both pulp and newsprint. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Aug.	486	6.6	5,632	2.7
Uncoated groundwood (s)	Aug.	126	−6.0	1,495	0.5
Coated paper (s)	Aug.	556	14.9	6,092	0.6
Uncoated free sheet (s)	Aug.	881	6.1	10,456	8.1
Other printing/writing	Aug.	115	4.5	1,379	3.1
Total packaging and other paper (s)	Aug.	422	−4.1	5,134	−1.1
Tissue	Aug.	429	3.9	5,069	2.6
Total paper	**Aug.**	**2,945**	**2.6**	**35,152**	**3.0**
Unbleached kraft paperboard	Aug.	1,574	11.4	17,636	7.3
Semichemical medium	Aug.	482	6.4	5,359	5.5
Bleached paperboard	Aug.	342	−5.8	4,304	7.9
Recycled paperboard	Aug.	687	2.1	8,159	7.5
Total paperboard	**Aug.**	**3,086**	**6.3**	**35,458**	**7.2**
Total U.S. paper and paperboard output	**Aug.**	**6,030**	**4.5**	**70,610**	**5.1**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	July	4,726	5.2	56,911	4.6
Market pulp production	July	636	7.8	7,428	7.4
Wastepaper consumption at paper/board mills	July	1,320	8.9	16,547	9.0
Pulpwood consumption (cords)	July	7,812	11.3	91,260	6.0
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Aug.	23.726	2.4	187.608[6]	5.0
Containerboard inventories at U.S. box plants and mills	Aug. 1	2,389	−15.3		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	July	1,108	25.9	11,486	3.7
Imports of Canadian newsprint	July	801	25.7	8,338[6]	2.6
U.S. paper exports (including products)	July	426	37.0	4,706	18.8
Exports of unbleached kraft linerboard	July	195	45.5	2,170	25.6
Exports of woodpulp	July	299	−10.5	4,316	11.2
Norscan pulp inventories[4]	Aug. 31	1,052	−32.2		
Norscan pulp operating rates[4]	Aug.	95%	94%	94%	91%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Aug.	790	5.5	6,098[6]	2.2
Operating rates	Aug.	93%	94%	93%	92%
Inventories held by U.S. consumers	Aug. 31	1,439	−7.9		
Other paper/board shipments	Aug.	512	6.9	3,980	9.8
Woodpulp shipments (export only)	Aug.	656	12.5	5,175[6]	12.0
Operating rates	Aug.	93%	90%	93%	88%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

KRAFT PAPER: Capacity withdrawals and steady demand keep market tight

Grade structure: Unbleached kraft paper (UKP) is normally divided into four end uses: bag and sack, shipping sack, wrapping, and other converting. Bag and sack paper is the largest category, accounting for about 60% of total shipments, followed by multiwall shipping sacks, 23%; other converting, 14%; and wrapping, 3%.

Basis weights for bag and sack paper range from 30 lb to 80 lb/3,000 ft², with the lower basis weights being used for small grocery and merchandise bags while 70 lb is most commonly used for grocery carryout sacks. Multiwall shipping sack paper is 50 lb or 60 lb. Extensible or air-dried paper may be used for shipping sacks requiring extra strength.

Production/capacity: UKP shipments declined 7.1% to 3.4 million tons last year, reflecting weak demand in many end uses and the permanent shutdown or conversion of five paper machines over the 1984-85 period with a total capacity of more than 500,000 tons.

Shipments this year have held up much better and through August were only running 0.5% below a year ago. Nevertheless, shipments are expected to decline in the fourth quarter due to the shutdown of Champion International Corp.'s 236,000-tpy No. 5 machine at Pensacola, Fla., for conversion to uncoated free-sheet. The company's No. 3 machine at Roanoke Rapids, N.C., was down for several weeks in September for a rebuild that will lift capacity by as much as 90,000 tpy and permit multiwall paper production.

For all of 1986, UKP shipments are expected to decline about 1.6% to 3.35 million tons, resulting in an operating rate of 96%—adjusted for the removal of a 125,000-tpy machine at Jacksonville Kraft Paper Co., which was shut down in late 1985.

Next year UKP shipments are forecast to decline about 2.1%, reflecting some loss of market share to plastic in the grocery bag and sack market as well as reduced U.S. industry capacity. This would result in an operating rate of close to 97%—assuming the Jacksonville mill is reactivated in the second quarter. Consumption of unbleached kraft paper is expected to show a somewhat smaller decline in 1987 because of higher imports from Canada and possibly other countries.

Market segments: If unbleached kraft paper prices continue to rise, more capacity could become available on swing linerboard or bleached paper machines. The danger is that UKP could lose more share to plastic film, especially in the grocery market.

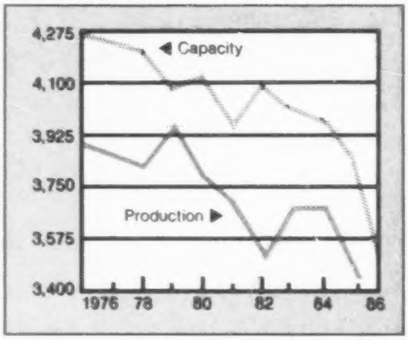
Grocery bag and sack paper shipments declined 6.8% to 2.0 million tons in 1985 but this year will only show about a 1.5% decline. Paper carryout sacks have continued to withstand competition from plastic T-shirt bags mainly because of consumer preference. Paper industry sources estimate plastics market share this year at around 12% to 15% (the plastics industry places its share at 20% to 30%). But a growing price differential between paper and plastic sacks could cause more supermarkets to shift to plastic next year.

Multiwall shipping sack paper volume dropped 9.5% to 795,000 tons last year and will decline about 5% this year, reflecting continued weakness in agriculture markets. Next year shipments are forecast to rise about 2%, with some improvement in the farm economy. Wrapping and other converting demand for multiwall paper dropped 4.3% to 565,000 tons in 1985 but should show only slight dips this year and next.

Pricing: UKP paper prices came under heavy discounting pressure in 1985 due to soft demand and low-priced spot tonnage from swing linerboard machines. But prices began to rise sharply this year helped by the capacity withdrawals and the tight linerboard market. In three increases, grocery sack paper (70 lb), for example, rose from a low of $260/ton to around $340 in April and another $30/ton increase was announced for October. A second increase on multiwall paper brought the price of 50 lb to $420 to $430 in September.

Year-end price history for 70-lb grocery sack paper is as follows: 1980, $280; 1981, $300; 1982, $240; 1983, $280; 1984, $330; 1985, $300; 1986 (mid-year) $340. Multiwall sack paper (50 lb): 1980, $375; 1981, $405; 1982, $360; 1983, $380/$410; 1984, $390; 1985, $360; 1986 (mid-year), $390. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1985	1986e	1987e
Shipments[1]	3,403	3,350	3,280
Capacity[2]	3,862	3,495a	3,395a
Utilization rate	88.1%	96.0%	96.6%
Imports[3]	65	105	125
Exports[3]	68	75	75
Apparent U.S. consumption	3,400	3,380	3,330
lb/capita	28.4	28.0	27.5
GNP ratio	0.95	0.93	0.89

e = Estimate. a = Adjusted.

1. American Paper Institute data.
2. Capacity for 1986 adjusted for removal of 125,000-tpy Jacksonville Kraft machine, which is expected to resume produciton by the second quarter of 1987.
3. Dept. of Commerce data.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container[1]	634	18.1
2. Georgia-Pacific	415	11.9
3. Union Camp	415	11.9
4. International Paper	260*	7.4
5. Longview Fibre	250*	7.2
6. Champion Intl.[2]	240	6.9
7. Gilman Paper	230*	6.6
8. Westvaco	150	4.3
9. Chesapeake	115	3.3
10. Mid-America[3]	110	3.2

Market share of top five companies:
56.5%

Market share of top ten companies:
80.6%

Total U.S. capacity (1986):
3.495 million short tons

1. Excludes possible purchase of 40% interest in Jacksonville Kraft.
2. Reflects shutdown of Pensacola, Fla., No. 5 machine, rebuild of Roanoke Rapids, N.C., machine.
3. Acquired Weyerhaeuser Co.'s Pine Bluff, Ark., mill in early 1986.

*Excludes bleached packaging paper capacity.

ENERGY

Cogeneration will climb, despite tax reform

Cogeneration capacity of the U.S. pulp and paper industry is now about 7,500 MW, leading U.S. industry with about 35% of the nation's total installed cogeneration capacity. This is expected to increase to 9,000 MW by 1990, according to a survey conducted by the American Paper Institute.

Respondents to the API's survey represent about 88% of the U.S. pulp, paper, and paperboard industry production. About 32% of the industry's cogeneration capacity is located in the southern Atlantic region. The southcentral region is a close second with 30.8%, followed by northcentral at 12.6%, New England at 10.4%, Mountain and Pacific at 9.4%, and the mid-Atlantic region with 4.8%, the API reports.

Spent liquor is the primary fuel of choice for 34% of the industry's cogeneration facilities. About 26.7% use coal, 13.3% use wood, 13.3% use No. 6 oil, and 11.7% use natural gas, according to the API. The amount of electricity sold to utilities by the industry's cogeneration plants almost doubled between 1983 and 1984, increasing from 1,182.7 million kWh to 2,493.2 million kWh over the period (see accompanying table). 1986 promises to set records: 1,023.3 million kWh of electricity, or 9.3% of total inplant electric generation being sold to utilities during the first quarter.

PURPA evolves. Prior to the enactment of the Public Utility Regulatory Policies Act (PURPA) in 1978, pulp and paper companies did not have very much incentive to cogenerate power in excess of their own requirements. PURPA ensured that cogeneration plants would be interconnected to the local utility's grid and required utilities to buy cogenerated power at a fair price. Since PURPA was enacted, the API calculates that the industry has added over 2,100 MW to its cogeneration capacity. API data show that the industry increased its electricity production using cogeneration by 26% between 1982 and 1985. This is expected to increase to 30% in the next five years if PURPA remains unchanged.

The hitch is utilities' reluctance to follow PURPA. It took a ruling by the Supreme Court in 1983 to uphold PURPA in the face of challenges by several utilities. Now states are drafting various laws that curtail PURPA's effectiveness, and there are some indications that the government may reopen the rulemaking on PURPA.

Tax law regresses. With the reduction in credits for capital investment under the new tax law, utilities can no longer claim a mill is getting a deal when it builds a cogeneration facility. Cogeneration equipment that is used primarily for producing steam and electricity for onsite consumption, including systems powered by jet engines, internal combustion engines, and combustion turbines not used in combined cycle systems, will be depreciated over 15 years. Cogeneration equipment that is primarily used to take advantage of the sale of electricity to utilities will be depreciated over 20 years. The old tax law permitted all cogeneration equipment to be depreciated over five years.

The new law will eliminate energy tax credits as of Dec. 31, 1985. Those credits that continue because of a contract will be reduced to 65% of their normal value. Electrical and steam transmission and distribution equipment will also be depreciated over 20 years.

To add insult to injury, the continuing decline of oil and gas prices means that utilities do not have to pay as much for cogenerated electricity. Still, it is in the paper industry's best interests to keep electricity costs as minimal as possible: its annual electricity bill is over $2 billion by the API's calculations. The paper industry is the third-largest purchaser of electricity among manufacturing industries in the U.S. ■

U.S. pulp and paper industry inplant electric generation, including hydroelectric.

Year	Total (million kWh)	Sold to utilities[1] (million kWh)	Sold to utilities[1] (% of total)	Cogenerated[2] (million kWh)	Cogenerated[2] (% of total)
1982	34,243.0	668.3	2.0%	27,843.6	81.3%
1983	37,527.4	1,182.7	3.2	30,464.2	81.2
1984	40,043.7	2,493.2	6.2	33,780.2	84.4
1983	40,156.6	2,883.2	7.2	35,221.8	87.7
1986[3]	11,001.0	1,023.3	9.3	9,694.2	88.1

1. Includes sales of gross electricity sold to public and private utilities.
2. Electricity generated by qualifying cogenerated facilities as defined by the FERC.
3. Figures for first-quarter 1986 only.

Source: American Paper Institute, Pulp, Materials & Technology Group.

EPA emission proposal threatens industry

Under the Environmental Protection Agency's proposed New Source Performance Standards, new industrial boilers that burn oil or coal and have a heat input of 100 million BTU or more would be required to reduce sulfur emissions by 90% from the current level. Also, overall emissions from new boilers would be limited to 1.2 lb sulfur/million BTU of heat input. The EPA estimates that industry contributes 1.5% of sulfur emissions in the country. Utilities, which account for the majority of sulfur emissions, would only have to lower emissions by 70% under the proposed law.

The proposed standards would require new boilers to have scrubber systems, which in some cases cost as much as the boiler itself. The scrubber systems could be avoided if the industry burned cleaner fuels, such as natural gas. However, natural gas is more expensive than coal or oil and is prohibited as a boiler fuel by the Fuel Use Act. (The Fuel Use Act may be repealed if H.R.4669, which passed the House recently, becomes law.) Observers say the new regulation would discourage investment in new boilers, keeping older, less-efficient boilers operating and aggravating the air pollution problem. Manufacturers and cogenerators will be hardest hit by the regulation. The EPA will issue final standards before Dec. 1. ■

Acid rain bill could be costly—decision next year

According to the Council of Industrial Boiler Owners (CIBO), pending acid rain legislation could cost nonutility industries approximately $3.5 billion annually in boiler control costs and energy taxes. The House of Representatives is debating H.R.4567, a bill feasibility of the paper mill. Another $500,000 could be made available to the county or municipality involved for support services such as sewers and roads.

This is not the first time interest has been expressed in kenaf newsprint, which would be competitive with woodpulp-based paper at current newsprint prices, Taylor said. The American Newspaper Publishers Assn. has been looking into kenaf as a woodpulp alternative for a number of years. The ANPA funded a study that determined kenaf growing and papermaking could be very practical for underdeveloped nations, with crops harvested two or three times a year. The plant thrives in tropical climates.

The crop would be a boon to Texan cotton growers, who have seen the price of cotton fall so low that it is not worth the cost of putting seeds in the ground, said Elaine Timmerman of the Texas Dept. of Agriculture.

Earlier experimentation. In 1979, six newspapers in different areas of the U.S. used a trial run of 40 tons of 97% kenaf pulp newsprint. Former owner of the *Yuma Sun* (Arizona) and current president of Western Newspapers Inc. and member of the ANPA technical committee on kenaf, Don Soldwedel, said that the Sun's participation in the trial (a 36-page, 18,000-newspaper run) was on newsprint lighter in color than the woodpulp product that the Sun was then using. That paper has resisted aging in the intervening seven years. In addition, the Sun's press run did not require a stop due to linting or breakage, although linting would have been a problem on a larger run, Soldwedel said. Last month's tests were partly designed to reduce linting.

In the 1950s, the U.S. Dept. of Agriculture made a survey of how many plants could be sources of newsprint pulp, and kenaf came out a top contender. Soldwedel does not expect kenaf to replace woodpulp but to supplement it. It could even be used in combination with woodpulp and recycled newsprint.

KI has been growing the kenaf crop for five years on 55 acres of a 15,000-acre farm in the south of Texas, said Delbert Langford, general manager of Rio Farms in Headcouch. The crop would need to bring in about $300 to $500/acre (harvested about every 130 days) to be profitable and competitive with the Canadian newsprint industry, Langford said. ■

OUTLOOK

World paper/board demand to grow 2.6%/year

World paper demand is expected to rise to between 246 million and 255 million metric tons by 1995, according to a new study by the United Nations Food & Agricultural Organization (FAO). This represents an annual growth rate between 2.6% and 2.9% from the 1984 level of 187.3 million tons.

The projections are based on two world economic scenarios, one developed by the FAO and other U.N. agencies and another slightly less optimistic scenario from Chase Econometrics. Also, an Industry Working Party (IWP) made up of paper industry experts from 30 countries contributed to the study and developed its forecasts based on changing end use patterns, according to Irene Meister, vice president-international, American Paper Institute, who participated in the study.

In many cases, the IWP forecasts are more pessimistic than the projections based on the two economic scenarios. For example, IWP forecasts that paper and paperboard will reach only a 240-million-ton demand level in 1995.

The fastest growth in consumption is expected to take place in the developing countries, where growth in demand is projected to rise at around a 5% average annual rate through 1995, according to the FAO's *Outlook Study for Pulp & Paper Supply & Demand to 1995*. The growth rate in the developed market economies, however, is expected to be only a little better than 2%. The centrally planned economies are projected to show a growth rate of around 4% to 5% (with the highest rate in Asia and slower growth in the Soviet Union and eastern Europe).

Outlook Study projections for pulp indicate an increase in consumption from 1984's 140 million tons to between 177 and 181 million tons by 1995. However, the ratio of pulp content per ton of paper will decrease noticeably from 0.74 to 0.72. Wastepaper consumption will increase sharply from 49 million tons to between 83 and 85 million tons and will account for 32% of total worldwide fiber supply to the industry in 1995.

Average per capita consumption of paper and paperboard worldwide is projected to rise to 44 kg in 1995. This compares with 25 kg per capita in 1960 and 38 kg in 1984.

Total world printing/writing paper demand is projected to reach between 73.5 and 75.5 million tons in 1995. This represents an annual growth rate of between 4.2% and 4.7% from the 1984 level of 48.8 million tons. The IWP forecast is less optimistic at 67.7 million tons in 1995, reflecting such factors as slower growth in special interest magazines and increased electronic communication.

World newsprint consumption is

Total world paper/board consumption projections to 1995 (million metric tons).

	Actual	FAO		Chase	
FAO regions, subregions	**1984**	**1990**	**1995**	**1990**	**1995**
Developed market economies	**144.4**	**156.1**	**177.1**	**155.9**	**172.7**
North America	73.4	76.1	82.6	78.3	84.6
West Europe	46.7	50.6	58.9	50.4	56.8
Oceania	2.5	2.8	3.2	2.9	3.3
Others	21.6	26.5	32.2	24.2	27.9
Developing market economies	**20.1**	**27.9**	**37.0**	**26.5**	**34.7**
Africa	0.8	1.1	1.4	1.1	1.3
Latin America	9.7	13.3	17.0	11.9	15.2
Near East Africa	0.4	0.7	0.9	0.6	0.7
Near East Asia	1.3	1.7	2.2	1.6	2.1
Far East	7.7	10.9	15.2	11.1	15.2
Centrally planned economies	**22.8**	**31.8**	**40.6**	**31.5**	**38.5**
Asia	7.5	12.1	16.2	14.5	20.0
Europe, USSR	15.2	19.7	24.4	16.9	18.4
World	**187.3**	**215.9**	**254.8**	**214.0**	**245.9**

Source: United Nations Food & Agricultural Organization's *Outlook Study*.

projected to reach between 39.3 and 39.7 million tons by 1995 under the Chase and FAO economic scenarios. This would reflect a 2.8% to 3.1% annual rate of growth from the 1984 level of 29.2 million tons. The IWP, however, forecasts total world demand at 36.4 million tons.

Other paper and board demand is projected to reach between 132.9 and 139.4 million tons by 1995, representing a 2.1% to 2.8% annual rate of growth. In this case, the IWP forecast is higher, at 141.2 million tons. Econometric forecasts for this broad category are more uncertain because it consists of unrelated grades such as tissue, containerboard, and packaging papers, according to Dr. Meister.

Where the data permitted, detailed analyses were performed in specific grade segments. Containerboard demand in the developed countries, for example, is projected by IWP to reach from 44.7 to 45.7 million tons, up from 32.1 million tons in 1981.

In the U.S., IWP forecasts containerboard consumption to reach 24 to 25 million tons by 1995, up from 17.3 million tons in 1981. European Community demand was to rise to 9.8 million tons from 7.1 million tons in 1981. Japanese consumption was estimated to reach 6.6 million tons in 1995 vs 4.6 million tons. ■

CAPITAL SPENDING

U.S. paper companies lower 1986 capital spending sights

U.S. pulp and paper manufacturers will not reach the $9-billion mark in capital spending this year after all, according to a survey by the Commerce Dept.'s Bureau of Economic Analysis. The BEA's most recent survey, conducted in July and August, shows papermakers shaving spending plans back to $8.87 billion for 1986. This is still a new record but down 2.5% from the $9.1 billion reported in the earlier April/May survey (*P&P*, Sept., p. 33). The latest figure is very close to earlier estimates of $8.80 billion and $8.85 billion made in late 1985 and early 1986.

At $8.87 billion, 1986 capital outlays would show a 3.2% increase over the 1985 level of spending of $8.59 billion (revised upward from an earlier estimate of $8.53 billion). In contrast, paper industry outlays jumped 21.8% in 1984, to a total of $7.21 billion, and 19.2% in 1985. Spending is expected to drop sharply in 1987 and 1988, according to a recent McGraw-Hill survey of paper companies.

The pace of spending this year increased from an annual rate of $8.67 billion in the first quarter of 1986 to $9.02 billion in the second quarter of 1986, the Commerce Dept. estimates. The third-quarter pace was expected to drop off again to $8.71 billion before finishing the year at a pace of $9.07 billion in the fourth quarter of 1986.

In spite of the lower estimate, spending planned by the paper industry looks quite healthy when compared with most U.S. industries, especially in the manufacturing sector. The survey showed that downward revisions were widespread. Overall outlays are expected to decline 1.9% this year compared with 1985, led by a 6.2% decline in manufacturing. Spending by nondurable goods makers will fall 5.5% compared with last year. ■

LABOR

Canadian IWA approves severing ties with U.S.

International Woodworkers of America delegates at an annual convention of Regional Council No. 1 in Nanaimo, B.C., voted to dissolve the international union by separating U.S. and Canadian groups. In addition, the IWA decided to pursue possible mergers with other Canadian unions.

The vote came at a time when the IWA is staging work stoppages at British Columbian sawmills to force the industry into a settlement. Only two pulp and paper mills have been directly affected, although others may be running low on woodchips.

Regional Council No. 1 of the IWA recently merged western and eastern Canadian locals into a group that now comprises 64% of the total 70,000 members in the international union. Now the same group wants to embrace such unions as the Canadian Paperworkers Union and the Pulp, Paper & Woodworkers of Canada—both represent workers mainly in the paper industry.

Meanwhile, a final vote on dissolution of the international union will be taken at the IWA's international convention this month.

Jack Munro, president of Regional Council No. 1, noted that the U.S. and Canadian IWA groups have had philosophical differences in recent years. The U.S. unions have negotiated concessions, which the Canadian workers have resisted. Most recently, U.S. workers at Weyerhaeuser Co., Willamette Industries Inc., and Boise Cascade Corp. voted for wage and benefit cuts in two-year contract settlements. Canadian workers are also unsettled about the threat of a U.S. countervailing duty on softwood lumber, which the U.S. locals reportedly support. ■

DIAPERS

K-C countersues P&G over design of disposable diaper

Last fall, Procter & Gamble Co. sued Kimberly-Clark Corp. for allegedly infringing its patent for construction of Luvs diapers (*P&P*, Sept. 1985, p. 37). Now K-C is countersuing P&G for allegedly "unlawfully monopolizing the market for disposable diapers." K-C is also seeking to change its defense in the P&G suit because it has reportedly discovered new facts that would alter the case. The companies will meet in court next year.

HUGGIES
Huggies
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The allegations concern the heat-shrinkable material that forms a portion of the diapers. Procter & Gamble maintains that K-C's Huggies brand diapers infringe a patent that P&G bought from Raychem Corp., Menlo Park, Calif.

Raychem invented a method of heat-shrinking the diaper material so that it retains its shape. P&G uses the process to construct Luvs' waistband, and it has sued K-C for using the material in the waistband of its Huggies diapers. P&G's suit seeks to prevent K-C from using the material and claims unspecified damages.

K-C is asking for triple damages, asserting that P&G's original patent is invalid and charging P&G with violating antitrust laws by trying to prevent effective competition in the disposable diaper market "at a time when P&G already had a dominant share of the disposable diaper market."

ISSUE FOCUS: ***CHEMICALS***

RECORD PAPER PRODUCTION BOOSTS CHEMICAL DEMAND—SPECIALTIES LEAD

P&P's chemical survey shows that pricing, supply are still favorable in many areas thanks to declining consumption in other industries

By MICHAEL J. DUCEY, Technical Editor

Pulp, paper, and paperboard production was strong through the first half of 1986, increasing 3.8%, 2.8%, and 4.9%, respectively, compared with the same period last year. Currently, there is no indication that rates will fall significantly in the latter portion of the year, putting 1986 near or above the record levels of 1984. Correspondingly, chemicals—commodity as well as specialty—will experience growth in consumption over 1985. Fewer equipment innovations that reduce chemical charges are evident, and installation of such equipment currently available has leveled off.

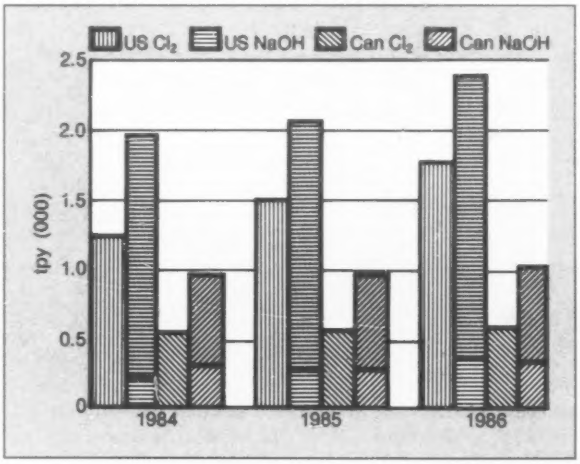
Prices have been climbing steadily. Sources of commodity chemicals have slimmed due to technological advances in production as well as an industry shakeout that began when prices fell in the beginning of the 1980s. The industry has accepted the price increases slowly, perhaps because prices of paper products have shown strength recently. Most commodity chemicals remain in oversupply, so demand will have to remain strong to hold prices. Suppliers report that the shakeout may continue since not all producers have scheduled modernizations that would help keep them at acceptable operating costs.

Consolidation of the paper industry and its suppliers is also reaching an unprecedented level. As a result, centralized buying and selling will prevail, and this probably is not very good news for suppliers. Suppliers are seeking diversified product lines, and the overall trend is to pursue production and sales of value-added products. Some of these products are customized, even on a commodity level, and acceptance has been strong for the suppliers who have experimented with this marketing strategy.

Chemical consumption has followed a general trend for a number of years: curtailment in pulp mills and increases in paper mills. Research, development, and implementation of equipment and chemical additions have favored this trend. In pulping, improved digester control, mixing technique, chemical input and production, recovery efficiency, and byproduct use have helped mills more efficiently use chemicals. In papermaking, alkaline sizing, forming enhancers, demand for coated stock and improved printability, and other research seeking higher consistencies for forming have placed greater emphasis on chemicals as a way to improve operations and product quality.

This survey consists of information on sources, industry capacity, mill demand, and current prices as well as commentary from this multibillion-dollar sector of the North American industry (one source estimates the value of mill purchases at close to $3.5 billion). Results from the U.S. and Canada have been combined since so many parallels exist in chemical consumption. All ma-

FIGURE 1: **North American chloralkali demand.**



jor chemicals and their chief suppliers are accounted for, as are many widely used but often overlooked chemicals. *P&P*'s sources for the survey include mills and suppliers, plus consulting firms and research institutions that track chemical consumption in the pulp and paper industry. All figures represent a combination of those sources, including estimates. *Pulp & Paper* invites comments on the material and its accuracy. ■

PULPING CHEMICALS

CHLORALKALI

North American industry chlorine capacity: 33,750 tpd. North American industry caustic soda capacity: 36,000 tpd.

Sources: Dow Chemical (4 plants), PPG Industries (2 plants), Olin (3 plants, plus a joint venture with Du Pont scheduled for startup in late 1987), Occidental (11, with the acquisition of Diamond Shamrock), LCP Chemicals (5 plants), Vulcan Chemicals (3 plants), Stauffer Chemical (3 plants), Pennwalt (3 plants), and C-I-L (3 plants). Those with one operating facility include Du Pont, Mobay Chemical, FMC, B.F. Goodrich, Formosa Plastics, Kaiser, and two papermakers: Weyerhaeuser Co. and Georgia-Pacific Corp.

Supplier forecast: Plant closures totaling some 8,000 tpd of chlorine and caustic over three years have trimmed supply, but the industry still sees itself in an overcapacity situation. Industry implementation of membrane cells, now operating at five sites in the U.S. (commercially at Taft, La., Tacoma, Wash., and Wichita, Kans.), reduces energy consumption by one-quarter or more compared with mercury or asbestos diaphragm cells, making it easier to exist in the marketplace. Experts forecast closures will amount to 500 to 1,000 tpd in the coming years. Having firmed in the second quarter, prices seem to be sticking at the $200/ton level for both products (depending on shipping point). Operating rates are said to be slightly under 90%.

Mill demand forecast: Consumption of chloralkali products is driven by the amount of chemical pulp that is produced and bleached. Innovative techniques in pulping and bleaching have not really affected chloralkali consumption since most installations are directed at more expensive chemicals or improved brightness. A few mills still produce chloralkali chemicals onsite (one plant was installed in late 1984), but chloralkali must be selling at a healthy price to justify the large capital expenditure needed to build such a plant.

HYDROGEN PEROXIDE

North American industry demand: 9.5 million tpy.

Sources: Du Pont, FMC, and Interox have been dueling in the market for a long time. Each continues to try and outperform the others through expansions, modernizations, and new plant siting. Degussa is also planning to enter the North American market with a new plant in Alabama. Four locations in the U.S. currently produce hydrogen peroxide, while two are being constructed in Canada. Du Pont may start up its facility in Maitland, Ont., later this year, while FMC is still pondering the size of its new complex in Squamish, B.C.

Supplier forecast: Steady demand and stable energy costs have helped producers enjoy a healthy market. Bleached mechanical pulps will grow in importance, and hydogen peroxide will be a key factor in its development and implementation. Average estimates place hydrogen peroxide's growth above 10%/year, far above any other chemical involved in pulping. Prices have been steady, but pressure on the list (45¢/lb 70% solution technical grade) will be evident, especially if expansions in mechanical pulps and chemical pulps slow very appreciably.

Mill demand forecast: More than 30 bleached chemical pulp mills use hydrogen peroxide, and many more continue its addition on a trial basis. Users apply between 1 and 6 lb/ton of pulp, depending on the addition point and purpose. Mechanical pulp bleaching remains the real growth area, where processes call for applications of 1% to 2% and more (based on wood). New processes are being developed with peroxide as the main bleaching agent. An onsite hydrogen peroxide generator is being built in Thunder Bay, Ont., which could start a trend if it is successful.

LIME

North American industry capacity: 23 million tpy.

Sources: Commercial lime is processed in 30 states by nearly 60 companies at more than 100 locations. Canada chips in another half dozen locations from three principal suppliers. Leading suppliers to the industry are Steel Bros. and Beachvilime in Canada, and Kerr-McGee, Dravo Lime, Mississippi Lime, Marblehead Lime, USG Industries, and many others in the U.S. Limestone is also available from most suppliers.

Supplier forecast: Use of lime in mills closely follows the production of kraft pulp, so growth will always be associated with new capacity. Wastewater treatment accounts for a fair portion of all consumption. Limestone

FIGURE 2: **North American hydrogen peroxide demand.**

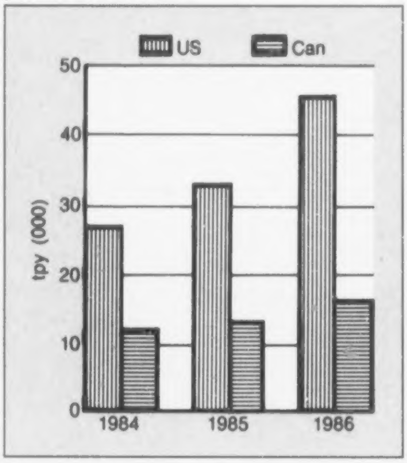


FIGURE 3: **North American lime demand.**

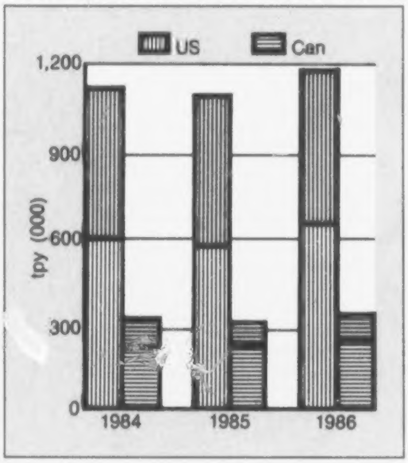
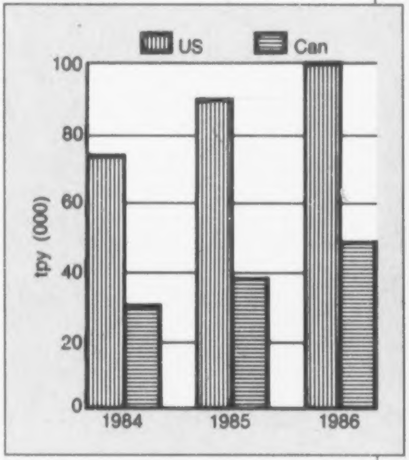


FIGURE 4: **North American oxygen demand.**



has not really threatened consumption trends since the feasibility of using it instead of other lime products usually diminishes when transportation, energy, and processing costs are considered. Prices will probably remain flat for a while, as the major user—the steel industry—continues in a state of flux.

Mill demand forecast: Kraft pulping is forecast to increase about 2%/year with announced expansions through 1990. No new greenfield mills such as the ones built in the early 1980s (Champion International Corp., Quinnesec, Mich.; Union Camp Corp., Eastover, S.C.; Leaf River Forest Products Inc., New Augusta, Miss., etc.) are planned. Water treatment areas (in both existing and new mills) have potential for increased consumption, particularly if environmental regulations continue to stiffen. Recovery systems currently regenerate 90% or more of all lime, so makeup lime accounts for all kraft pulp mill consumption—roughly 50% of the total consumed by the industry.

OXYGEN

Sources: Five companies supply oxygen to pulp mills in the U.S., and four do so in Canada. Industry capacity is not really known since it is an air product and is sometimes referred to as a specialty gas (where swing production can occur).

Mill demand forecast: Oxygen's cost, application, and environmental benefits are being realized at more locations. It has found a home in bleacheries as both a substitution chemical and delignifier and as stopgap measure in lime kilns and pollution systems. Suppliers maintain that every bleaching system will eventually employ oxygen in some capacity. In lime kilns and pollution systems, oxygen will be used when small capacity increases occur and when environmental limits tighten until the mill can cure the problem with a major equipment purchase.

SALTCAKE

North American industry production: 12 million tpy.

Sources: Many suppliers, such as Prior Chemicals, Ashland Chemical, and Allied are brokers, with the exception of Kerr-McGee, Saskatchewan Minerals, and Courtlands. Thus, each supplier has many producer points (in some cases over ten). Mills use a low-grade product that is available locally as one of the byproducts of industrial production.

Supplier forecast: For suppliers, pulp-grade saltcake consumption has been negatively impacted by a number of market influences lately. The supply is not expected to change from today's capacity, although mined saltcake has been declining for 15 years and synthetic production has been flat since 1980. Its "byproduct" stature has contributed to the curtailment in its production and use. Suppliers are adjusting to shifts in the market by introducing higher-quality products to stronger demand areas, such as detergent producers. Prices have stagnated in 1986 at $55/ton (list), with large discounts available in some areas.

Mill demand forecast: Competition from products such as emulsified sulfur and caustic, increasing (actually balanced) yields from chlorine dioxide plants, and better digester control with improved performance have curtailed saltcake use. Some saltcake is finding its way into chemimechanical operations, but growth there is uncertain and usage rates are not enough to offset past losses. The best estimates place a negative growth rate for saltcake at 3%/year.

SODA ASH

North American industry capacity: 10.9 million tpy.

Sources: FMC, Henley (formerly Allied), Texasgulf, Stauffer Chemical/UPRR, and Tenneco all have plants operating in Wyoming. Kerr-McGee operates two facilities in California.

Supplier forecast: Operating rates for soda ash producers are low, as is demand by the pulp and paper sector and its number one consumer—glassmakers. Technological advances in soda ash production, namely solution mining, have occurred slowly due to a sluggish market and lack of capital. With the closure of a synthetic plant in Syracuse, N.Y., operating rates have risen (reportedly above 80%), and prices have been higher. Unfortunately, demand is stagnant now and is likely to be so in the future. The only relief is the export market, where growth is estimated at 5%/year through 1990. Adding to the woes of producers, one supplier prophesized that the market for boxboard products using corrugating medium, where soda ash is used in the production of neutral sulfite semichemical (NSSC) pulp, will slow down in the near future because of the realization of consumer debt and other economic factors that influence spending on big retail items.

Mill demand forecast: As sulfite pulping declines and kraft mills continue to use caustic for their sodium needs, it appears that soda ash consumption will be flat or perhaps even decline. The savior may be an unpalatable rise in the cost of caustic soda, opening up the possibility of using soda ash as the sodium source for pulping liquor.

SODIUM CHLORATE

North American industry capacity: 550,000 tpy.

Sources: Six producers supply both liquid and dry product to chlorine dioxide generators—three of them have operations in the U.S. and Canada. The trend in production, like that of the chloralkali industry, is toward installing more cost-effective equipment. Metal anode cells have replaced graphite cells at two locations this year, and conversions at two other sites are slated to start up in 1987. Use of crystalline chlorate seems to have caught hold in the industry for economic reasons as well as usage flexibility.

Supplier forecast: The trade press has been quick to point out that a balance of supply and demand is at hand. As a result, price increases are beginning to emerge, although conflicting viewpoints have been heard on discounts. There should be an ample supply of chlorate throughout the decade. The shakeout of inefficient plants continues and consumption remains strong. Prices at the end of the first quarter fell more than $300/ton (crystalline), but at press time suppliers had boosted prices above $325/ton, still lower than the levels of the early 1980s.

Mill demand forecast: Chlorine dioxide is coming of age. Most bleached pulp mills are using it in the chlorination stage. Although mixed results in higher substitution use have been recorded, many still consider it for both quality and environmental purposes. Chlorine dioxide has also been used in papermaking systems for biocide treatment. Many mills are considering new systems since the average age of the generators is well over 20 years. Reports from abroad indicate chlorine use is detrimental to the environment, which could increasingly limit its use in favor of chlorine dioxide.

SODIUM HYDROSULFIDE

North American industry capacity: 200,000 tpy (both low and high purity).

FIGURE 5: **North American saltcake demand.**

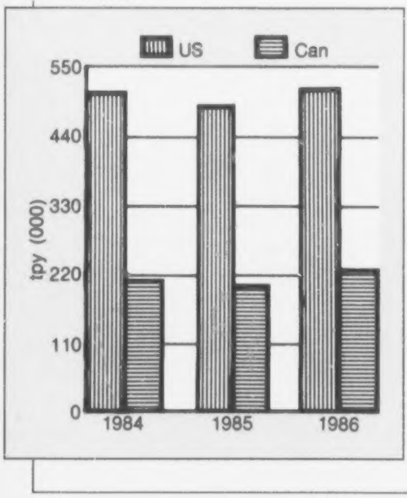


FIGURE 6: **North American soda ash demand.**

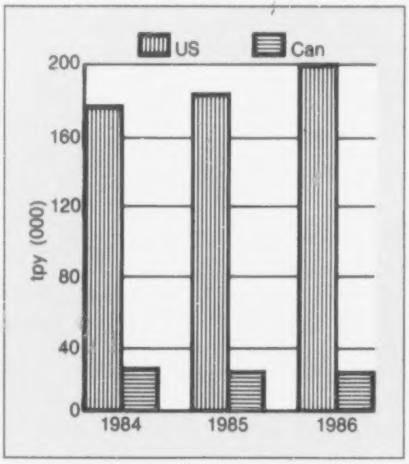
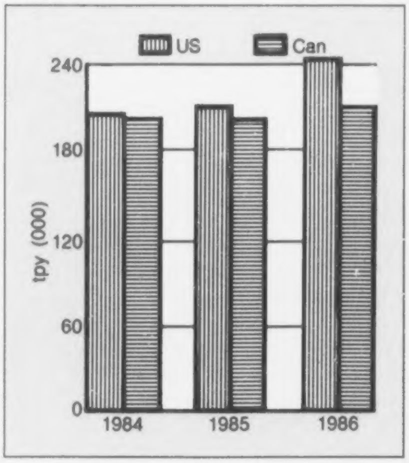


FIGURE 7: **North American sodium chlorate demand.**



Sources: Four companies produce high-purity product, which does not usually find its way into kraft pulping operations. Most pulp mills acquire their low-purity, low-strength product from small refineries, bromine producers, and other small operators who offer it as a byproduct.

Supplier forecast: Byproduct producers are somewhat elastic in the market, quite like crude tall oil producers in the pulp byproduct market. Slight shifts have occurred in high-purity production, and overall capacity stands at 45% of the total. Prices vary tremendously, but the top grade sells for $475/ton, with pulp mill purchases falling down to 50% of that for the low-grade products.

Mill demand forecast: Tied to kraft pulp production, consumption of sodium hydrosulfide has other possibilities for increased use. Cooking liquor containing essentially all sodium sulfide and cooking at 100% sulfidity has been tested successfully on a pilot level. In obtaining greater control over cooking, many mills have incorporated higher sulfidity levels, increasing strength and yield. Looking at current operations, consumption will probably be flat unless modifications are made, which would certainly be at a slow pace if at all.

SODIUM HYDROSULFITE

North American industry capacity: 76,000 tpy, plus 15,000 tpy generated onsite.

Sources: Two producers, Olin and Virginia Chemicals, operate five plants in the U.S. providing site-ready sodium hydrosulfite. Ventron supplies a solution containing sodium borohydride, which reacts with sulfur dioxide for onsite production of sodium hydrosulfite.

Supplier forecast: About 21,000 tpy of product has been phased out in the last four years, with only 7,000 tpy being replaced. No changes are apparent in supply for the future, while availability continues to be fairly loose. Prices are near 78¢/gal, but discounting is prevalent because of soft markets in textiles and mechanical paper grades. Operating rates are said to be above 95%.

Mill demand forecast: With Canadians taking the lead, mills are moving away from sodium hydrosulfite and toward hydrogen peroxide for their bleaching needs. Higher brightness requirements are the chief reason for this. Very few new generators have been built for onsite production. Suppliers are responding by offering a more customized product with additives that will satisfy the mill's bleaching targets. Mills that currently use or generate sodium hydrosulfite will probably incorporate it into expanded projects, but it would be risky to predict that this will be the case for all new mechanical pulping lines.

SULFUR

North American industry production: 16.34 million tpy.

Sources: Suppliers have been dwindling lately as supplies themselves dry up. Only two companies produce Frasch grades in the U.S., although several market grades are produced from recovery methods. A similar situation exists in Canada. Imports from Canada have also declined, perhaps due to Canada's falling deposits. The U.S.S.R. is expected to be the world's leading supplier in the next decade, with nations in the Middle East increasing their interest as well.

Supplier forecast: The supply of elemental sulfur is expected to be flat for 1986, while nonelemental sulfur supplies will drop for the second straight year. Prices have moved nicely over the past 30 months due to steady demand, decreasing supplies, and inflation. If the fertilizer industry picks up, prices could skyrocket.

Mill demand forecast: Sulfite pulping methods are being used less, with chemimechanical processes, wastepaper

FIGURE 8: **North American sodium hydrosulfide demand.**

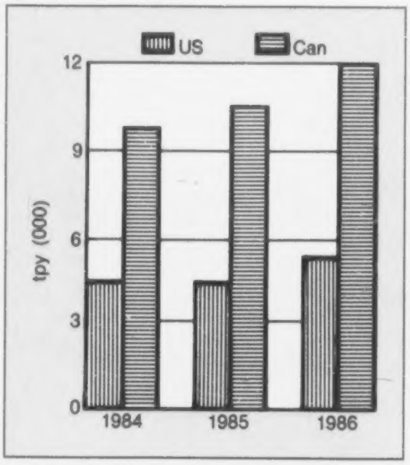


FIGURE 9: **North American sodium hydrosulfite/sodium borohydride demand.**

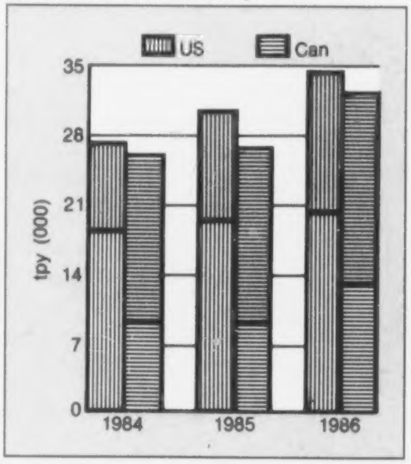


FIGURE 10: **North American sulfur demand, includes saltcake makeup use.**

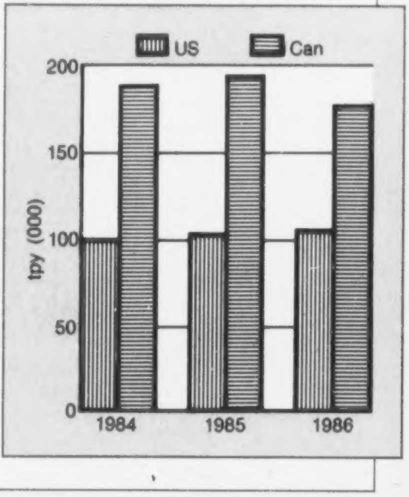


FIGURE 11: **North American sulfur dioxide demand.**

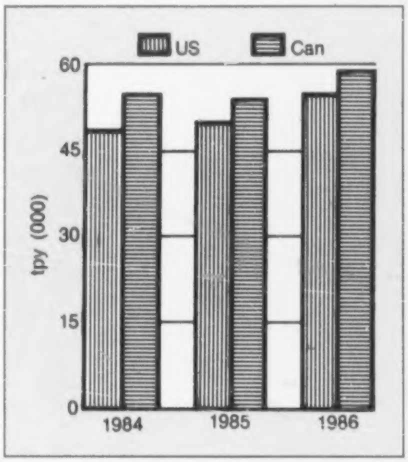
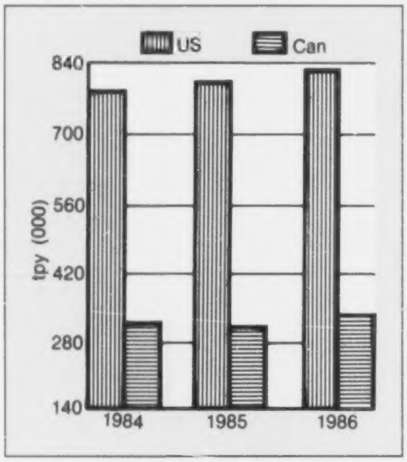


FIGURE 12: **North American sulfuric acid demand.**



usage, and substitution chemicals all contributing to the demise. Environmental restrictions on discharges, particularly in Canada, have also helped reduce sulfite pulping output.

Newsprint makers continue to use sulfur in their furnishes, although at ever decreasing amounts. Elemental sulfur is making headway in use as a sulfur makeup chemical in kraft pulping. Emulsified sulfur products, with attractive prices and applicability, are becoming more accepted in the market.

SULFUR DIOXIDE

North American industry capacity: 270,000 tpy.

Sources: Seven companies produce liquid product for commercial use at ten locations in the U.S. Two units have been closed down in three years, and no new capacity is scheduled for the near future.

Supplier forecast: Balanced supply, particularly in the West, along with other industries' expanded use, should help firm pricing. Internal generation and consumption by some companies may impinge on that firmness. Another problem influencing price is the supply and cost of sulfur, which has been unsteady lately. The long-term outlook for prices is especially uncertain. Current list price for a bulk liquid shipment is around $200/ton, depending on location.

Mill demand forecast: Overall, consumption will be flat for many years, and it has been declining for the decade. Downward turns in sulfite pulp production, newer chlorine dioxide processes, and reduced use in chemical pulp bleaching have all contributed to this trend. A partial offset may occur in mechanical pulping operations and in other innovative or alternative sulfite pulping processes.

SULFURIC ACID

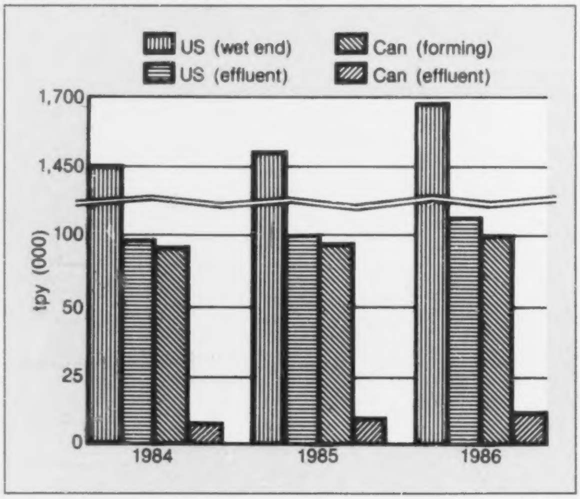
North American industry production: 40 million tons.

Sources: The U.S. has 76 producers, Canada adds another dozen. It is North America's largest chemical in terms of production. A few suppliers have expanded capacity in response to geographic or market needs, but no major shifts in sources are seen for the 1980s. A new source of sulfuric acid is being developed from phosgyp, a byproduct of phosphate production, but a commercial-scale facility is still a few years away.

Supplier forecast: Like other commodity chemicals, sulfuric acid is having trouble in markets outside the pulp industry. Its use in fertilizer production is predicted to grow, but recent history dictates otherwise. Other markets such as mining, oil refining, and metal production are off too. Without demand strength in these areas, prices have been flat for two years and have dipped this year for both virgin and smelt products.

Mill demand forecast: Most sulfuric acid is used in the production of chlorine dioxide, with some being consumed in acid adjustment and washing. Projections differ on its direction in pulp mills, but if predictions for chlorine dioxide are accurate, growth will be steady. Its use in pulping and washing will likely remain constant.

FIGURE 13: **North American aluminum sulfate demand.**



PAPERMAKING CHEMICALS

ALUMINUM SULFATE

North American industry production: 3.2 million tpy.

Sources: There are a half dozen alum manufacturers in the U.S., and a few other companies deal for them also. In Canada, three producers operate in eight locations.

Supplier forecast: Alum suppliers see themselves in a declining market chiefly due to the downturn in use in water and wastewater treatment, where the majority of business is. Application in sizing and water treatment in papermaking is seen to be increasing as a function of expansion in the industry. Prices are flat or down in most areas, and no hikes are apparent for the future.

Mill demand forecast: Slow conversions to alkaline papermaking have helped stabilize papermakers' alum consumption. No changes in addition rates or the alum-to-rosin ratio have been seen, and some new wet end additives have actually increased alum additions incrementally (a few lb/ton). In water treatment, addition rates vary with water use and the amount of solids present in mill influent. Growth again will be tied with production, particularly in bleached grades and grades containing high filler and coating materials.

CALCIUM CARBONATE

North American industry production: 1.425 million tpy (85% ground natural grades).

Sources: Six companies produce ground natural grades at 11 locations, while only two firms supply precipitated grades. There has been a lot of acquisition activity in this market, and no information is forthcoming on the motivation for it. No new capacity has been announced commercially, but some papermakers are installing their own onsite generators.

Supplier forecast: Attitudes on growth remain bullish. For both grades of calcium carbonate, the markets (paper, paint, plastics, rubber, etc.) all appear to be in good shape. Papermakers are switching to less-expensive ground natural, although roughly 70% of all product used is precipitated. Prices have been flat but firm for ground natural grades, while precipitated grades have experienced healthy gains.

Mill demand forecast: Papermakers are using more calcium carbonate in coating to achieve higher quality. Use as a filler is not moving significantly but is growing along with alkaline papermaking conversions. About 13% of the market is using this sizing method, which is expected to grow strongly over the long term. Many smaller machines (and smaller companies) have been quick to adopt the alkaline papermaking technique, but it is safe to assume that very few of the larger and qualified (uncoated free-sheet) machines will follow that lead over the near term. End users have been slow to accept these alkaline-sized products, but resistance is said to be softening.

A new trend in onsite generation of calcium carbonate is evident. Two locations in the U.S. are installing systems, bringing the worldwide total to five. The oldest, operating at American Israeli Paper Mills Ltd., has been providing versatile, quality products for over three years.

CORNSTARCH

U.S. industry capacity: 3.23 million tpy.

Sources: Nine companies operate 21 plants across the U.S. (mostly in the Midwest), while Canada has four firms. New capacity has been brought onstream by National Starch & Chemical, which tripled capacity at one mill and is building a complex in North Kansas City, Mo. CPC completed a major modernization in Argo, Ill.

Supplier forecast: Overcapacity has always plagued producers. Some companies are enjoying spectacular success in other markets (food and soft drinks), but the paper industry has been a tough sell. In response, suppliers are offering diversified products for different applications. They are meeting with meaningful, albeit slow, success. Prices have not moved in years for the unmodified product, and no real increases are seen ahead.

Mill demand forecast: The newest push for application of cornstarchs is in the wet end of paper machines. Addition rates vary with grade, and opinions differ on whether those rates are rising. Acceptance has been slow but steady. Most papermakers would like to use it but need justification (like anything else). In coating and

FIGURE 14: **North American calcium carbonate demand, incorporates all uses.**

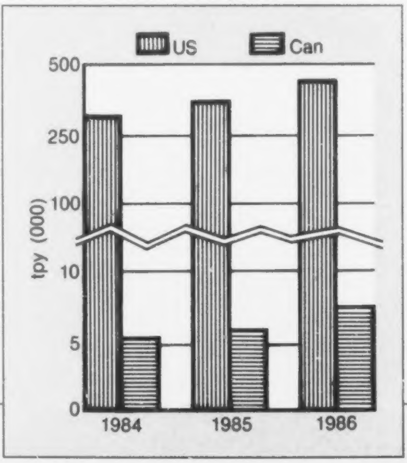
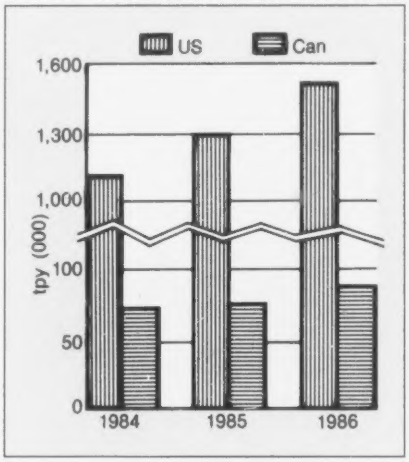


FIGURE 15: **North American starch demand.**

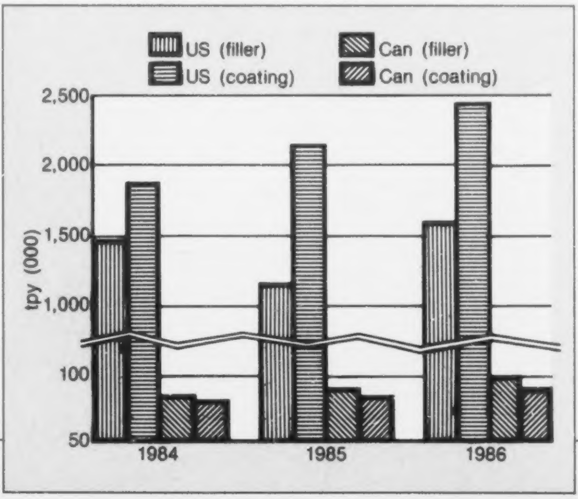


sizing operations, cornstarch has taken its lumps from polyvinyl alcohol (PVOH), styrene-butadiene latex, and protein, but its price competitiveness always ensures it of a strong place in the market. Formulations have not changed much in either area, and it does not appear that application in sizing or coating is vulnerable to equipment or other technological innovations.

Potato starch. A.E. Staley, among others, has introduced new starch products derived from potatoes that are targeted for use in alkaline papermaking systems. Mill information in this area has not been forthcoming, but one source mentioned that with conversion to alkaline papermaking, problems arise that do tend to offer opportunity for new additives.

The range of addition varies widely, but it has been revealed that fine paper makers will use between 5 and 20 lb/ton, linerboard uses from 40 to 60 lb/ton, and groundwood papermakers under 5 lb/ton. The results across a variety of grades have shown improvements in Scott bond, fold, stiffness, runability, and other important strength properties.

FIGURE 16: **North American kaolin clay demand.**



KAOLIN

North American industry production: 10.4 million tpy (27% for export).

Sources: Seven companies mine and manufacture kaolin clay products at 14 locations supplying the paper industry. The majority of papermaking clay comes from the state of Georgia. A few suppliers have increased capacity in the last three years, seemingly to keep pace with ever-growing demand for this effective inorganic filler and coating material.

Supplier forecast: Expanded product lines and increased service are the focal points for kaolin suppliers. Demand is strong for most grades, although value-added products are receiving a lot of attention because of the upward shifts in paper quality. Pricing is tougher to follow since the emergence of the new products, but it is safe to assume increases for all grades should average around 5% for 1987. Higher price boosts for the top clays are probable, particularly if demand for them continues to be as strong as it has been.

Mill demand forecast: Kaolin is one of the few chemicals to maintain demand increases even in tough market and economic situations. Its price, availability, and versatility make it attractive at all times. Use in coating formulations (where it makes up, on average, at least 60% of the components) is stable. Alkaline papermaking conversions have not changed consumption patterns appreciably, although kaolin will continue to be challenged as a filler material. With growth forecasts for coated paper and printing and writing grades still bullish, kaolin clay should maintain a growth rate above 4%/year through 1990. Another factor supporting these claims is the tight supply of titanium dioxide, where top-quality kaolin is used as an extender and opacity stabilizer.

POLYVINYL ALCOHOL

North American industry capacity: 120,000 tpy.

Sources: Du Pont and Air Products operate plants in the U.S. Monsanto dropped out of the market at the end of last year, and its 9,000-tpy plant remains idle. No new capacity has been announced for the future.

Supplier forecast: Polyvinyl alcohol (PVOH) consumption is usually associated with the textile market, but since that has declined, other more favorable areas have emerged, such as adhesives and paperboard. As a result, demand will be flat. The fully hydrolized product used by the paper industry is near record level prices at $1.00/lb, but discounting is evident. Price and demand will probably follow GNP cycles through the 1980s.

Mill demand forecast: As market forces for higher-quality paper and paperboard products drive demand, the use of PVOH will increase. PVOH is seen as a superior adhesive, binder, and surface-sizing material with and without starch. Together with its strength as a barrier and grease resister, papermakers feel its use and price can often be justified because it outperforms other materials used in these applications. However, problems in rheology, usually in makedown and delivery, are still a concern in switching to PVOH.

STYRENE-BUTADIENE LATEX

North American industry production: 415,000 tpy.

Sources: The majority of product shipped to the paper industry is shared by four companies, although as many as six more claim 20% of the market. Two of the four operate wholly owned subsidiaries in Canada. Expansion is difficult to track due to the secrecy of the suppliers, but since demand has climbed in the 1980s, supply has been adjusted accordingly.

Supplier forecast: Companies are pushing their products on this market like never before, mostly because of the pressure put on papermakers from end users for high runability and printability. As a result, growth forecasts, usually associated with coated paper capacity and price fluctuations, now hinge on every printing style in the market. Prices have edged up over time, but increases will probably surpass inflation should demand projections be realized.

Mill demand forecast: As the trend for higher-quality printing surfaces continues, coating formulations increase the amount of S-B latex, and some even use it exclusively. Coated paper capacity will grow 4% this year and 8% in 1987. Imports have hampered the market in the 1980s, but the falling dollar may offer some relief. Coated paper capacity increases abroad will really pressure prices later in the decade, which could drop operating rates and curtail the use of coating materials.

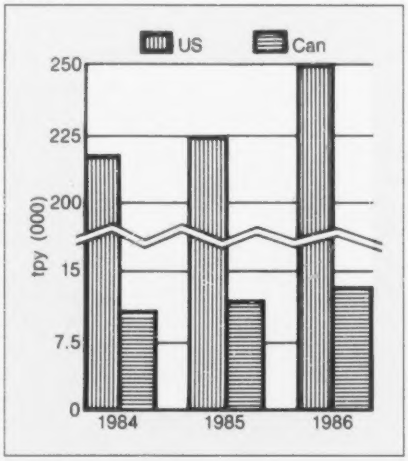
TITANIUM DIOXIDE

North American industry capacity: 950,000 tpy.

Sources: Four companies operate facilities in eight locations in the U.S., and there are two suppliers in Canada. About 25% of U.S. domestic supply has been cut in five years due to environmental problems encountered in processing. A few U.S. suppliers have announced plant construction offshore, so imports should continue the upward climb that began at the end of 1985.

Supplier forecast: Tightness in the market will persist unless the economy slumps. Announced domestic and offshore expansion will not be available until the end of the decade, so worldwide supply will be tight as well. The major end users are coatings (50%), paper (25%), and plastics (12%). They are all in a growth phase. Prices are firm and at an all-time high for all grades. Prices will increase next year, but opinions on the extent differ widely among suppliers. Operating rates are over 93%.

FIGURE 17: **North American titanium dioxide demand.**



Mill demand forecast: Value-added products are in vogue for all industries, and the paper industry is no exception. This trend favors titanium dioxide consumption since it offers the maker higher quality opportunities than other filler and coating materials. Consumption per machine is increasing as are the number of machines using the product. Paperboard and uncoated printing and writing grades will be big users in the near term. If coated paper demand picks up due to increased advertising or media events such as elections or the Olympic games, titanium dioxide's future will brighten.

OTHER CHEMICALS

Table 1 lists other major chemicals used in the industry. All of them will follow the growth trends associated with their application, with defoamers and surfactants reaping the biggest gains. Synthetic sizes have not been included, although they represent some 15,000 tpy and will covet the alkaline papermaking and recycled newsprint expansions. Biocide consumption is also rising because of concerns for quality and paper machine runability. Dye use continues to climb as demand increases for colored paper across all grades.

Retention and drainage aids, wet and dry strength additives, and felt washing and conditioners represent $250 million worth of purchases. As more chemicals and less fiber are used in papermaking systems, their consumption is sure to increase. ■

TABLE 1: **Other materials (total North American demand).**

	PVOH	PVAc	Rosin	Defoamer	Surfactants
1984	6.2	76	159	42	15
1985	9.8	79	166	48	18.5
1986	10.1	85	189	59	22

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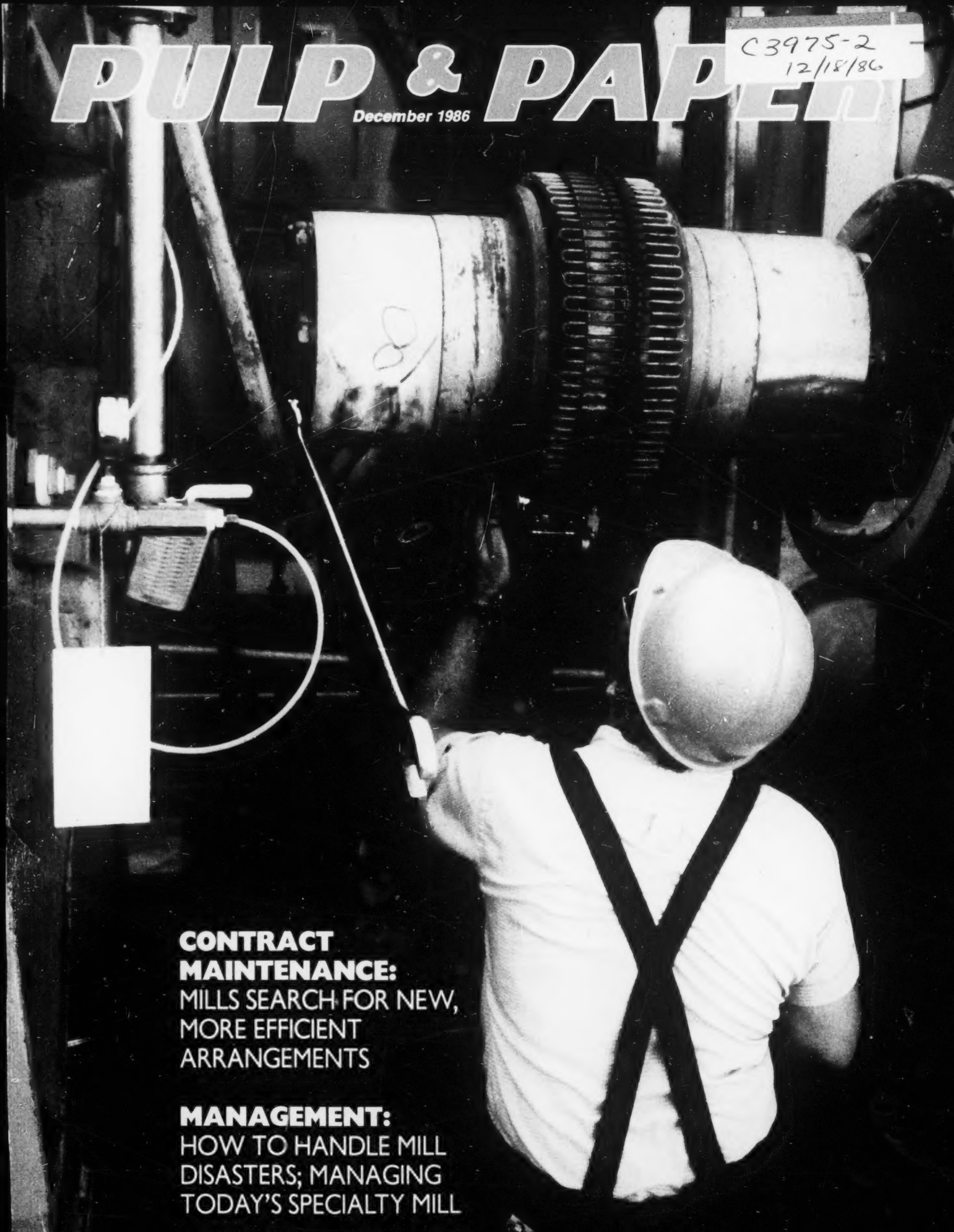
PULP & PAPER

December 1986



CONTRACT MAINTENANCE:
MILLS SEARCH FOR NEW, MORE EFFICIENT ARRANGEMENTS

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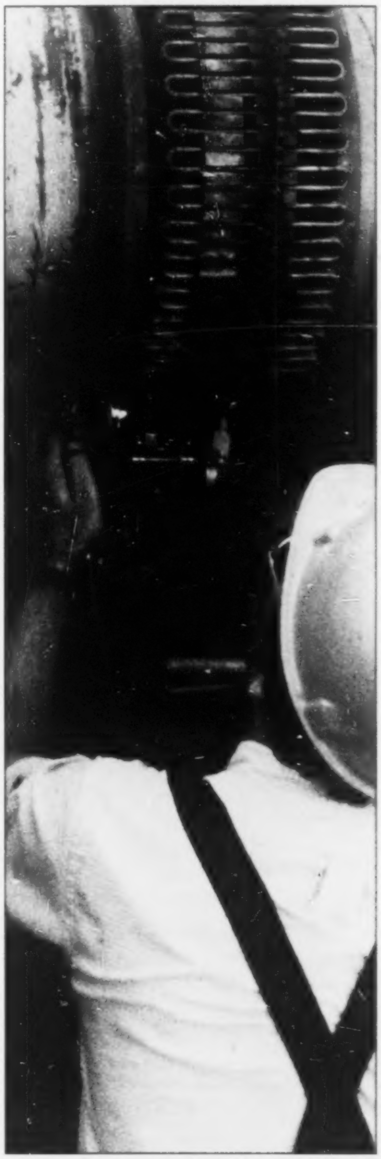

THE COVER

Contract maintenance, an aspect of the December issue's focus on mill maintenance, is being increasingly relied upon by pulp and paper mills to improve cost-efficiency. **(Photo by Scott Robertson, BE&K Construction Co.)**

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PULP & PAPER (ISSN 0033-4081) is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Circulation Department, PULP & PAPER,
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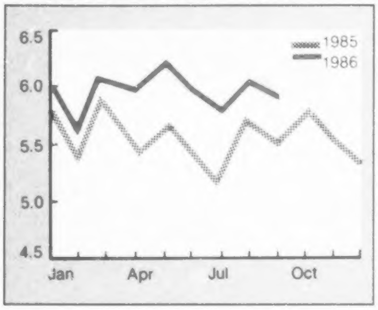
U.S. paper and board production



U.S. production of paper and paperboard totaled 5.9 million tons in September, up 6.1% from the previous year, according to American Paper Institute data. Production for the third quarter surged ahead at an 8.1% annual rate, the API said, and established a new seasonally adjusted high of 70.7 million tpy. Preliminary data for early October show that trend of record production continuing.

Among major grades, uncoated free-sheet and bleached paperboard led the increases in September, with production for the first three quarters in both grades up 8.4% compared with last year. Packaging papers posted the only decline, while most other paper grades were up about 3.0% over last year and board grades rose an average of 7.0%. Corrugated box shipments set a new record for September, according to the Fibre Box Assn., and containerboard inventories were down 13% from the same period last year.

Canadian newsprint shipments were 4.1% ahead of last year's level, the Canadian Pulp & Paper Assn. reported. September market pulp shipments were up 3.7% despite the strike in British Columbia, with operating rates at 83% for the month. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Sept.	462	3.4	5,622	2.8
Uncoated groundwood (s)	Sept.	132	7.3	1,505	1.1
Coated paper (s)	Sept.	555	27.0	6,155	3.2
Uncoated free sheet (s)	Sept.	877	10.3	10,468	8.4
Other printing/writing	Sept.	112	1.8	1,375	2.5
Total packaging and other paper (s)	Sept.	425	−9.2	5,147	−1.7
Tissue	Sept.	419	5.8	5,064	3.0
Total paper	**Sept.**	**2,982**	**7.5**	**35,337**	**3.8**
Unbleached kraft paperboard	Sept.	1,437	2.1	17,593	6.8
Semichemical medium	Sept.	450	6.6	5,363	5.6
Bleached paperboard	Sept.	346	12.0	4,287	8.4
Recycled paperboard	Sept.	669	5.5	8,145	7.3
Total paperboard	**Sept.**	**2,902**	**4.7**	**35,387**	**7.0**
Total U.S. paper and paperboard output	**Sept.**	**5,884**	**6.1**	**70,723**	**5.4**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Aug.	4,833	7.0	57,184	5.1
Market pulp production	Aug.	673	24.4	7,511	9.5
Wastepaper consumption at paper/board mills	Aug.	1,390	7.4	16,563	8.6
Pulpwood consumption (cords)	Aug.	7,582	9.5	91,226	6.4
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Sept.	24.390	9.4	211.998[6]	5.7
Containerboard inventories at U.S. box plants and mills	Sept. 1	2,344	−13.0		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Aug.	1,001	14.7	11,552	5.0
Imports of Canadian newsprint	Aug.	714	11.7	8,367[6]	3.7
U.S. paper exports (including products)	Aug.	394	10.7	4,708	17.7
Exports of unbleached kraft linerboard	Aug.	182	10.3	2,171	22.7
Exports of woodpulp	Aug.	418	38.0	4,403	14.3
Norscan pulp inventories[4]	Sept. 30	920	−34.1		
Norscan pulp operating rates[4]	Sept.	91%	97%	94%	91%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Sept.	840	19.1	6,928[6]	4.1
Operating rates	Sept.	91%	92%	93%	92%
Inventories held by U.S. consumers	Sept. 30	1,461	−4.3		
Other paper/board shipments	Sept.	509	13.6	4,494	10.5
Woodpulp shipments (export only)	Sept.	591	3.7	5,780[6]	11.3
Operating rates	Sept.	83%	74%	92%	87%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

NEWSPRINT: Market improvement will continue as producers play catch-up

Grade structure: Standard newsprint basis weight is 30 lb/3,000 ft². A range from 28 lb to 32 lb is common in the U.S., although there has been some shift to the lighter basis weights in New England and some southern mills. Brightness is typically in the 55 to 61 range. About 75% of all newsprint used in the U.S. is delivered to daily newspapers. Most of the remainder is shipped to government printers, weekly newspapers, and commercial printers for such end uses as newspaper inserts, flyers, and comic books.

Production/capacity: North American newsprint output appeared to be heading for a record year as U.S. shipments surged in August to an annualized rate of 5.632 million short tons, up 2.7% from a year earlier. Canadian shipments through the same eight-month period were up just 2%. At the same time, total U.S. newsprint consumption reached a new peak annual rate of close to 14 million tons in August, according to the American Paper Institute.

Canadian mills supplied 56.5% of U.S. newsprint requirements in the first eight months of 1986, down slightly from 57% a year earlier, according to the Canadian Pulp & Paper Assn. An extended shutdown of MacMillan Bloedel Ltd.'s Port Alberni, B.C., newsprint mill due to strikes, however, reduced Canadian supplies somewhat.

In addition, U.S. publishers continued to find alternate outside sources of supply, with U.S. imports from countries other than Canada accounting for 5.5% of the U.S. consumption total through August, compared with 2.5% a year earlier.

Outlook: Most industry observers expect a moderate increase in U.S. newsprint demand of about 2.5% and a minimal expansion in North American capacity of about 1.3% in 1987. This should continue to bolster business next year and lead to increasingly tighter markets through late in the decade.

U.S. newsprint consumption is projected to rise about 2.5% in 1986, 2.8% in 1987, and 2.5% in 1988. At the same time, less than 1% annual increases in North American newsprint capacity should boost mill operating rates to 92% in 1986, 94.5% in 1987, 96% in 1988, and 97.5% in 1989, according to a consensus of forecasters.

It is likely that the western region will rebound first, as it was already experiencing tighter markets in the second half of 1986 due to various factors. In addition to a strike at the Port Alberni mill, a strike at Tasman Pulp & Paper Ltd.'s New Zealand mill caused tonnage from Crown Forest Industries Ltd.'s Campbell River, B.C., mill to be diverted offshore to Tasman's markets. At the same time, the North Pacific Paper Corp. mill in Longview, Wash., was directed to increase shipments to Japan.

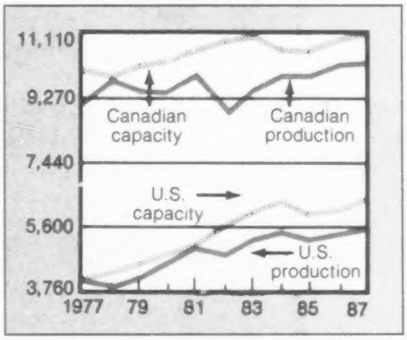
Pricing: Producers began in June to line up behind an attempt to raise prices 6.5% to $570/metric ton on Oct. 1. After failing to increase levels on seven previous occasions since July 1984 and following substantial discounting from late 1985 into the second half of 1986, producers appeared to be moderately successful in raising levels in the final quarter. Full implementation, however, was not expected until first-quarter 1987.

Some expect newsprint prices to go up as much as 8% to 10% in 1987 and to rise again in 1988. The next price announcment could come as early as next spring, observers indicated. Even the most conservative forecasts call for price improvement of about 5% in 1987.

List price history is as follows: (U.S. East, contract, year-end, per metric ton) 1974, $259; 1975, $284; 1976, $314; 1977, $331; 1978, $353; 1979, $413; 1980, $441/$470; 1981, $500; 1982, $468; 1983, $500; 1984, $535; 1985, $535; 1986, $535/$570.

Markets: Canada's market share in the U.S. was 57.1% in 1985, up from 56.9% in 1984 but down from 57.4% in 1983. Canada has supplied about 57% of U.S. demand for several years.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1985	1986e	1987e
United States			
Production¹	5,428	5,480	5,550
Capacity¹	5,820	5,825	5,845
Utilization rate	93.3%	94.1%	95.0%
Apparent U.S. consumption	13,611	12,788	13,920
lb/capita	113.6	114.1	114.5
GNP ratio	7.63	7.53	7.44
Canada			
Production²	9,907	10,170	10,500
Capacity²	10,825	11,040	11,110
Utilization rate	91.5%	92.1%	94.5%

e = *Pulp & Paper* estimate.

1. American Paper Institute data.

2. Canadian Pulp & Paper Assn. data.

TOP PRODUCERS *(000 tpy)*

	Annual capacity			Market share
	U.S.	Canada	Total	(%)
1. Abitibi-Price	372	1,759	2,131	12.6
2. Bowater¹	1,010	230	1,240	7.4
3. CIP	—	1,174	1,174	7.0
4. Kruger	—	893	893	5.3
5. MacBlo	—	842	842	5.0
6. Kimberly-Clark²	431	395	826	4.9
7. Champion	802	—	802	4.8
8. Boise³	517	283	800	4.8
9. Con-Bath	—	738	738	4.4
10. Ontario	—	735	735	4.4

Market share of top five companies:
37.2%

Market share of top ten companies:
60.4%

Total North American capacity (1986):
16.859 million tons

1. Includes Catawba Newsprint Co. (51.0% owned), Calhoun, Tenn., and Bowater Mersey Paper Co. Ltd. (51.0% owned).
2. Includes Spruce Falls Power & Paper Co. Ltd. (50.5% owned).
3. Includes Boise Southern, DeRidder, La.

SALES & EARNINGS

Paper industry profits soar

Paper companies reported improved earnings for the second consecutive quarter. Third-quarter earnings for U.S. paper/forest products companies were up 30.4% on a 4.8% increase in sales. The healthy showing was largely attributed to higher exports helped by the weak U.S. dollar, cost-cutting measures in place at most mills, and improving prices for pulp, linerboard, and uncoated free-sheet.

International Paper Co. reported a 23% jump in third-quarter profits compared with the second quarter. Excluding a $23-million charge IP took in the 1985 period for an early retirement program, IP's earnings almost doubled. Chairman and CEO John A. Georges commented, "Our results reflect the impact of cost-reduction programs, improved manufacturing operations, and firmer markets in most of our pulp, paper, and paperboard product lines." This offset the depressed price of IP's timber and wood products, a higher effective tax rate, and interest charges for the acquisition of Hammermill Paper Co. stock.

Hammermill managed to swallow a $21.3-million charge incurred from settling the merger agreement with IP and still turn in a large increase in earnings. W. Craig McClelland, president and CEO, attributed the performance to "our continued programs of marketing initiatives, cost control, effective asset utilization, and improving conditions in several lines."

James River Corp., now the second-largest U.S. paper company after IP, reported an 83.3% increase in earnings for its third-quarter ended July 27. Sales and earnings included contributions by recent acquisitions: Crown Zellerbach Corp., Cerex, Premoid, Canada Cup Inc., and Handi-Kup. James River reported that the assimilation of CZ, with ongoing sales of about $1.8 billion, is proceeding on time. Although prices for CZ's coated paper declined from 1985 levels, the market seems to be accepting James River's 5% price increase for commercial and industrial tissue.

With an earnings increase of 68%, Champion International Corp. seems to have digested its acquisition of St. Regis Corp. Savings were also realized by a restructuring program implemented July 1.

Market pulp comeback. Producers of market pulp owe the most gratitude to the declining dollar, which spurred export demand. Most pulp prices in the third quarter were up about $80/ton from the beginning of the year, and another $40 increase is being pushed through in the fourth quarter.

Weyerhaeuser Co. had a 61% rise in third-quarter earnings on an 8.5% increase in sales. Besides pulp, Weyco attributed this to strong lumber and plywood markets and improving containerboard prices. Weyco managed to turn in a profitable performance despite a strike that closed most of its sawmills in the Pacific Northwest for about 40 days during the quarter. Strikers have idled Weyco's Canadian logging since July 22.

Georgia-Pacific Corp. said operating profits in its pulp and paper segment rose to $51 million from $5 million last year, thanks to the weaker dollar and improved demand. G-P

U.S. paper/forest products industry third-quarter results.

	Third quarter ($000)			
Companies	**Sales**	**Change 1986/85**	**Earnings[1]**	**Change 1986/85**
Boise Cascade	$959,530	2.7%	$13,240[3]	−34.9%
Bowater Inc.	237,337	8.4	9,580	−41.9
Champion International	1,110,884	−16.5	63,834[3]	68.2
Chesapeake Corp.	161,822	1.1	6,189	80.8
Consolidated Papers	157,986	−8.1	20,183	−15.6
Federal Paper Board	222,028	23.5	9,920	385.3
Fort Howard Paper	450,095	24.0	42,506	−3.7
Georgia-Pacific	1,909,000	8.9	97,000[3]	67.2[4]
P. H. Glatfelter	68,713	5.8	9,000	8.7
Great Northern Nekoosa	514,500	8.2	34,600	260.4
Hammermill Paper	442,096	6.0	15,400[5]	175.0
International Paper	1,250,000	12.6	85,000	466.6[6]
James River (7/27)	1,100,000	74.9	46,200[7]	83.3
Jefferson Smurfit	267,202	71.7	7,783	102.7
Kimberly-Clark	1,065,000	4.9	63,000	1.1
Longview Fibre (7/31)	129,467	17.2	9,620	153.4
Louisiana-Pacific	407,390	22.6	22,200	55.1
Mead Corp.	837,400	18.0	36,300[8]	53.5
Mosinee Paper	49,837	4.1	1,034	−59.7
Pentair Inc.	163,174	26.4	3,169	−30.9
Pope & Talbot	78,055	−4.7	4,278	124.8
Potlatch Corp.	249,955	4.3	16,737	48.5
Scott Paper	819,700	7.0	38,200[9]	−32.1
Sonoco Products	240,604	6.5	13,050	5.6
Temple-Inland	333,800	7.4	20,100	14.8
Union Camp	515,910	11.2	36,427	80.8
Wausau (8/31)	57,121	8.0	2,919	2.8
Westvaco	463,043	10.5	25,938[2]	11.9
Weyerhaeuser	1,400,000	8.5	62,200	61.1
Willamette Industries	300,271	4.5	21,338	44.5
Total	**15,961,920**	**4.8%**	**$836,945**	**30.4%**

1. Income after taxes from continuing operations, excluding most significant items in both years.
2. Includes pretax gain of $6.7 million from the sale of certain operations.
3. Reflects change in method of accounting that reduced pension costs.
4. 1985 quarter included $30-million loss from disposal of discontinued oil and gas unit.
5. Includes one-time pretax gain from sale of Manning Paper Co. and settlement of insurance claim equaling $3.6 million. Includes one-time pretax loss of $21.3 million for defending against tender offer.
6. 1985 quarter included a $23-million charge for early retirement program.
7. Reflects acquisition of Crown Zellerbach Corp.
8. Includes one-time pretax charge of $13.2 million from discontinued operations.
9. Includes $38 million charge for a nine-week strike at Scott's Mobile, Ala., mill.

also said demand for its building products is healthy, although it said it is suffering from high levels of Canadian softwood lumber imports.

Great Northern Nekoosa Corp. had record third-quarter earnings of $34.6 million—more than triple the figure for the same period last year. Chairman William R. Laidig said, "We announced price increases in market pulp, containerboard, some business papers, and newsprint, effective Oct. 1. Costs remain under control, and our manufacturing facilities are in excellent operating condition."

Paperboard still on upswing. Jefferson Smurfit Corp.'s earnings improved 102.7% over 1985's third quarter on a 71.7% increase in sales. After Smurfit and the Morgan Stanley Leveraged Equity Fund acquired Container Corp. of America early in the fourth quarter, Smurfit became one of the biggest U.S. paperboard/packaging/wastepaper recycling companies.

Federal Paper Board Co. reported record third-quarter sales and a $2.4 million increase in earnings over the second quarter. The company's president, John R. Kennedy, said Federal benefited from an August price increase in bleached paperboard and "continued good backlogs." He reported that the bleached board mills in Augusta, Ga., and Riegelwood, N.C., set new production records during the third quarter.

Potlatch Corp. turned in a 48.5% increase in earnings for the quarter. The company said third-quarter shipments and selling prices for bleached paperboard were ahead of year-earlier levels. Its wood products group recorded its third consecutive profitable period, taking advantage of the prolonged wood products strike in Canada and more demand for domestic output.

Tissue producers struggle. Scott Paper Co.'s earnings in the third quarter were down 32%, although the company had record sales in the third quarter of $819.7 million. Scott attributed much of the decline in profits to a nine-week strike at its Mobile, Ala., mill and estimated earnings would otherwise have increased about 40%.

Kimberly-Clark Corp. managed to improve earnings by 1.1%, and Fort Howard Paper Co. took a 3.7% decline in profits. Prices suffered in food service disposables and tissue products. The company is counting on a 5% price hike in industrial tissue to ease the situation. ■

Canadian profits soar despite IWA strike

Canadian pulp and paper companies continued to enjoy the strong rebound in earnings begun in the second quarter, racking up a 119% increase in profits in the third quarter compared with the depressed year-earlier period. Sales for the quarter were up 9.8%, according to a *Pulp & Paper* survey of results from 14 companies. The strong earnings performance was attributed to the increase in pulp prices, improved operating rates for newsprint, better prices for most paper grades, and the weak Canadian dollar.

Because of these factors, many companies managed to offset the effects of the ongoing strike in British Columbia begun by members of the International Woodworkers of America in the middle of July. Observers estimate the strike has cost the Canadian industry, province, and workers about C$10 million a day. The strike has also resulted in a shortage in lumber and woodchips, causing some sawmills and pulp mills not directly involved in the dispute to curtail operations.

Strike impact. Although MacMillan Bloedel Ltd. enjoyed a 162% increase in profits during the third quarter, its earnings of C$47.4 million showed a decline from the C$90.4 million level that had been recorded in the second quarter. President and CEO of the company, Ray Smith, said this decline is largely due to the IWA strike, which has shut down the MB's British Columbian logging operations, IWA-certified lumber mills, and curtailed production at the Alberni and Harmac, B.C., pulp mills. Smith said the 10% increase in sales could be attributed to "higher shipment volumes of newsprint, pulp, corrugated containers, and building materials combined with higher prices for pulp and paper."

Canfor Corp. was also hard hit by the strike, but the company nevertheless managed a 190% increase in profits over the depressed levels of last year. Its Howe Sound Pulp Div. in Port Mellon, B.C., has been temporarily idled due to a lack of woodchips. The company's mill in Prince George, B.C., was down for the entire month of October for boiler maintenance, making a healthy showing in the fourth quarter unlikely even if the countervailing duty is struck down.

Canadian paper/forest products industry third-quarter results.

	Third quarter (C$000)			
Companies	**Sales**	**Change 1986/85**	**Earnings[1]**	**Change 1986/85**
Abitibi-Price	C$716,500	13.1%	C$31,100[2]	22.4%
British Columbia Forest Products	258,300	−7.0	9,500	111.1
Canfor Corp.	284,500	2.9	12,500	189.3
Consolidated-Bathurst	523,183	19.6	29,693[3]	32.7
Crown Forest Industries	221,000	−4.0	13,200[4]	73.7
Domtar Inc.	585,000	11.3	33,500[5]	73.6
Donohue Inc.	124,200	22.1	8,300	118.4
Fraser Inc.	150,000	14.1	5,800	344.9
Great Lakes Forest Products	159,389	0.9	8,853	759.2
MacMillan Bloedel	657,600	10.1	31,700	161.9
Paperboard Industries	20,400	16.6	1,180	107.0
Rolland Inc.	88,100	19.2	1,291	22.7
Scott Paper Ltd.	68,525	9.7	3,559	12.8
West Fraser Timber	110,400	27.0	14,100	228.0
Total	**C$3,967,097**	**9.8%**	**C$204,276**	**119.0%**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
2. 1986 quarter excludes extraordinary charge of C$2.3 million from writedown of certain assets and reflects change in method of accounting that reduced pension costs.
3. Includes a one-time debit of C$3.030 million from shut down of a mill. Last year's quarter excludes one-time pretax gain of C$7.136 million.
4. Excludes one-time loss of C$10.3 million from restructuring of Crown Stores subsidiary.
5. This year's quarter excludes extraordinary gain of C$3.9 million. 1985 quarter excludes extraordinary gain of C$5.8 million.
6. Quarter ended Aug. 31.

The Mackenzie, B.C., pulp mill of British Columbia Forest Products Ltd. has also joined the ranks of those idled because of the strike, and this has contributed to a 7% decline in sales during the third quarter. Profits remained strong, however, at about 110% over last year's period.

Crown Forest Industries Ltd. saw its sales decrease by 4% during the quarter, but the company's earnings were 74% over last year, reaching their highest level in seven years. Strong demand and improved pulp prices "more than offset" the effect of the British Columbian strike.

Eastern results. Companies located in eastern Canada showed higher profits for the third quarter in general. Consolidated-Bathurst Inc. reported that higher shipments, improved prices in bleached kraft pulp, and good results in its U.K. newsprint operations accounted for the company's 33% increase in profits during the period. Con-Bath plans to complete the construction of a new CTMP bleach plant at its mill in Bathurst, N.B., by the end of the year.

Thanks to lower manufacturing costs and higher average exchange premiums on U.S. dollar sales, Great Lakes Forest Products Ltd. recorded a large increase in profits. While increased shipments of fine paper and kraft pulp aided sales, lower shipments of building products and newsprint offset these gains. The company said the countervailing duty could "jeopardize the future of our lumber operations."

The 15% countervailing imposed by the U.S. on softwood lumber from Canada—on which a final determination is expected to be made in December—is creating uncertainty in the fourth quarter. Still, most Canadian producers are looking forward to reaping the results of the Oct. 1 newsprint price hike (US$35/ton) and another hike in market pulp prices. ■

EXPANSIONS

Consolidated Papers plans kraft pulp expansion

Consolidated Papers Inc. has submitted permit applications to the Wisconsin Dept. of Natural Resources for a $48-million expansion project that would increase pulp production at the company's kraft division to 1,000 tpd.

The plan includes a new 1.4-million lb/day black liquor solids recovery boiler, expansion of the existing lime kiln from 180 to 300 tpd, and a new smelt dissolving tank, according to H. Maxwell Hughson, vice president of manufacturing. The division currently manufactures over 600 tpd of pulp.

"As we have expanded our papermaking capabilities, it seems prudent that we consider expansion of our pulpmaking operations to obtain the quality raw material necessary to keep us the leader in enamel printing paper and specialty paper.

"These improvements would enable us to achieve the 1,000 tons of pulp per day needed to better supply our four papermaking divisions with hardwood and softwood kraft pulp," Hughson said.

In its third-quarter report, George W. Mead, chairman and CEO, said the company in 1985 supplied 74% of its own pulp needs. But additional fiber will be needed for the recently completed No. 26 coated groundwood machine in Wisconsin Rapids, Wis.

Consolidated has three sources of fiber, Mead said. The first is thermomechanical and groundwood pulp for magazine and catalog papers. The company always keeps some spare capacity on hand and manufactures what it needs. For the second source, hardwood and softwood kraft pulp, Consolidated fills all its own hardwood and softwood needs to the extent of the kraft mill capacity. The firm also purchases softwood pulp.

Normally, the company does not like its purchased softwood pulp to exceed 15% to 20% of total fiber needs. Yet the 660-tpd machine will require the company to buy about 30% or more in 1987, Mead said. ■

Ottawa blamed for delay in Gaspé SC mill project

Saugbrugsforeningen is ready to build a C$377-million supercalendered (SC) paper mill in the Gaspé peninsula town of Matane, Que., but the project is pending funding approval from the federal government, Quebec government officials said.

The mill, which would produce about 180,000 metric tpy, would be built in conjunction with Rexfor, the provincial forestry agency. The province and the federal government are to share the costs of financing equally, but details of the package have not been disclosed. According to one report, Saugbrugsforeningen and Rexfor each will put up C$40 million, with the remaining C$297 million being financed by the two governments.

The province reportedly approved the financing worked out in June. Delays in getting approval from Ottawa have increased cost estimates for the mill by C$50 million since last spring, according to one account. It was noted, however, that Saugbrugsforeningen and Rexfor had both agreed in writing to absorb any additional costs rather than seek more funding.

In the meantime, however, Quebecor Inc. and Redec (Canada) Inc. have not yet officially given up on a proposal to build a 180,000-metric-tpy newsprint mill at the same location. This project was mothballed when the province decided on the SC mill plan instead, but that could change if funding is not secured. On the other hand, Quebecor is also interested in acquiring at least part of Donohue Inc. for its newsprint holdings, which would redirect its investment plans. ■

Fibreco going ahead with plans to build BCTMP mill

Fibreco Export Inc. is going ahead with plans to build a bleached chemithermomechanical market pulp mill with capacity for 180,000 metric tpy in interior British Columbia, chairman Gordon Steele and president Tony Jarrett announced recently. Financing for the C$170-million mill has been completed, preparations for construction will begin immediately, and an exact site will be announced in the near future. Startup is scheduled for late 1988.

The mill will have two separate lines to ensure that pulps are made to various customer specifications, according to Jarrett. "The equipment and technology will be the best available on the market." Ekman & Co. AB of Sweden will have worldwide exclusive sales and marketing responsibility for the mill's output.

Fibreco was formed in 1977 by 38 British Columbian interior sawmill companies to develop an international market for residual woodchips. The company has become a leading exporter of chips through its bulk terminal in North Vancouver, B.C. "The new pulp mill is a logical extension of

Papermaking: Consumption, prices moving with production

Consumption. As production of paper and paperboard reaches record-breaking levels, the additives that help achieve those marks, too, have moved parallel to consumption. The two major inputs, rosin size and aluminium sulfate, have been in decline in a unit applied per machine perspective, but machine capacity increases have helped to maintain their overall market consumption. Alkaline papermaking has also hedged in on alum and rosin use but not nearly as quickly or as thoroughly as initially forecasted. The difference in addition for alum for a conversion is roughly 50%. Alum is also a cheap retention aid, although pH must be controlled in narrow range to make it effective. The cost advantage is important, especially since other process aids are helping to retain alum and therefore reduce its consumption rate.

The emphasis today is on customized or specialized products which afford opportunities to mills for the uniformity and runability required in today's market. Ever increasing amounts of wet- and dry-strength additives are being used across all grades. Typical addition rates are around 1 to 2 lb/ton on wood and woodfree grades, and sometimes as high as 10 lb/ton for board grades. The rates also vary with regard to strength and quality requirements

Retention and drainage aids, mostly sold as a unit although not exclusively, are consumed in the 1 lb/ton area, unless a system has excessive fines or high ash content. Significant development of polymers over the past 20 years has helped consumption growth of these operational aids.

Additionally, as suppliers continue to introduce new and more operation-specific products, their use should remain at a strong level. Biocides, dispersants and chlorine dioxide are also in a competition against microorganisms that create flaws in the sheet. A host of chemical compounds, both organic and inorganic, are being applied in under 1 lb/ton additions in the average case.

The wet end additives with the most potential for usage growth in paper and paperboard processing (excluding modified starches) are synthetic sizes. Already applied in newsprint systems using secondary fiber furnishes and alkaline papermaking systems, AKA, AKD, PVAc, CMC and others improve strength, stiffness and surface characteristics of paper. The wet end conditions currently using these products are predicted to grow at a great rate over the short and long terms, and synthetic sizes will grow along with them. The average usage rate is between 2 to 4 lb/ton.

They are not wet end additives per se, but felt conditioners and wire life extenders are also included in the specialty area. Their growth is also predicted to run strong through the next decade. Addition rates hover at around 1 lb/ton, depending on the contaminants in the furnish. The use of felt conditioners and wire life extenders has been strongest in newsprint and other secondary fiber furnishes. However as technologies change requiring more sophisticated clothing, so too do the chemicals to enhance their value in life and performance.

Price. Suppliers in the specialty chemical for papermaking market have been very active over the past years, jockeying for position by introducing new products, modifying or expanding producing locations, and making management moves facilitating favorable vantage points. Hercules Inc. started up a 40-million/lb plant for emulsified sizing products. Diamond Shamrock Chemical Co. acquired Economics Laboratory Inc.'s Pulp & Paper Division. Exxon Chemical Americas bought Callaway Chemicals Co. Foreign competition will come from AKZO Chemie America, purchasers of Monsanto Co.'s wet end product line, and Tenneco Inc. which has been successful in Canada and is now establishing a base in the Southeast. Nalco Chemical Co. Pulp & Paper Chemicals Group, Dow Chemical Co. and Betz Paperchem Inc. will of course maintain their efforts in this market as well. The one casualty besides Monsanto is Borden Inc., which bowed out in 1985.

The prices for the commodity chemicals, alum and rosin, have been flat for five years and discounting has been evident. For alum, there are indications that prices are firming due to an increase in consumption (due to paper production) and some reduction in supply. Specialties vary due to the manufacturers' delivered form and formulation, but most are around $1/lb. Prices for these products are only expected to go up when formulations change (i.e., new product introduction) because many intermediate chemicals used in the the formulas are in long supply.

TABLE 1: **Papermaking additives growth predicted for the 1980s (excluding starches).**

Chemical	1986 value (millions dollars)	1990 value (millions dollars)	Change per year (%)
Alum	65	70	+1.0
Rosin	133	150	+1.0
Wet-strength	80	103	+6.5
Dry-strength	80	100	+6.0
Defoamers, dispersants	36	46	+6.0
Biocides	40	48	+4.5
Synthetic sizes	30	41	+8.0
Retention aids	51	67	+7.0
Felt cleaners	10	16	+10.0

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PULP & PAPER

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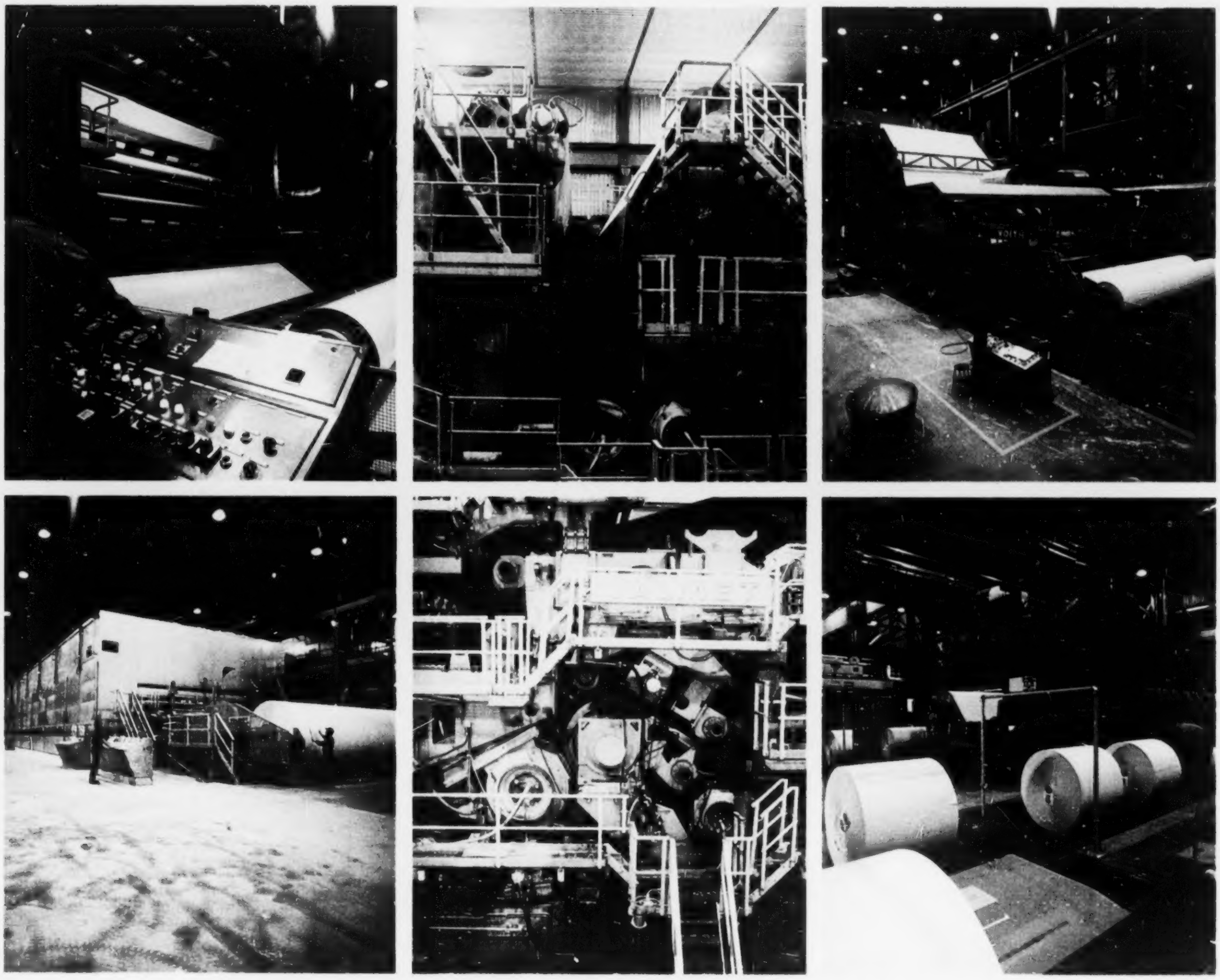

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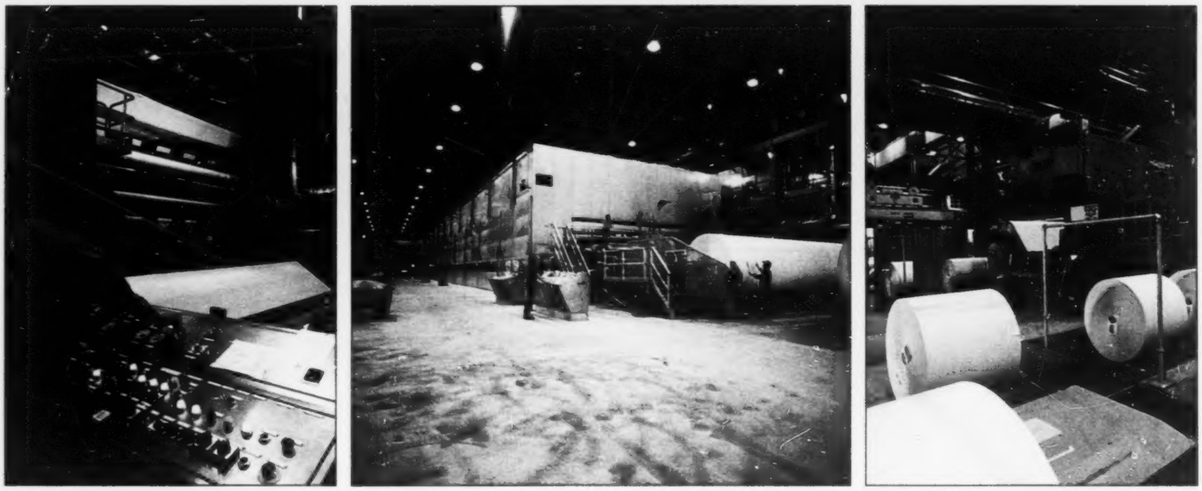

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Miramichi Pulp & Paper Ltd., Canada's newest paper mill, successfully began producing lightweight coated paper at Newcastle, N.B., last summer.
(Photographs courtesy Castagne Communications.)

CAPITAL SPENDING

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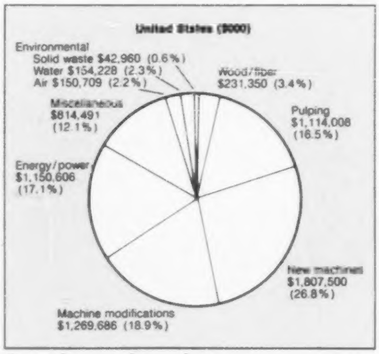

Canadian pulp and paper companies are boosting capital spending plans once again, but in the U.S., companies are cutting back after completing major expansion programs in 1986

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PULP & PAPER (ISSN 0033-4081) is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Circulation Department, PULP & PAPER,
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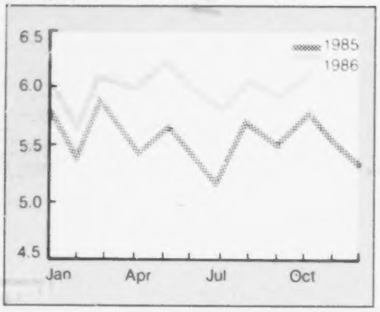
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard jumped to 6.2 million tons in October, up 5.8% compared with a year earlier, according to the American Paper Institute. Factoring in preliminary data for November, the API estimated final 1986 production at a record-breaking 70.6 million tons, or 93.4% of available capacity. That would be 5.3% higher than in 1985, when high inventories and the strong dollar depressed production, and 3.1% higher than in 1984, the previous record year.

Among major grades, record corrugated box shipments and steadily declining inventories helped fuel a resurgence in containerboard output, with kraft paperboard production up 6.8% compared with last year. Other board grades were also strong, and paperboard production overall was expected to reach a record 35.1 million tons for 1986, up 6.2% from 1985 and 3.1% from 1984. Coated and uncoated free-sheet papers led the gains in the paper sector, where production for 1986 was expected to reach 35.5 million tons, up 4.3% from 1985.

Canadian newsprint shipments were up 3.6% in October from a year earlier, while woodpulp shipments jumped 11.8%. Operating rates were 97% for both grades. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Oct.	469	4.5	5,623	3.0
Uncoated groundwood (s)	Oct.	137	−6.8	1,519	0.1
Coated paper (s)	Oct.	569	18.3	6,222	4.6
Uncoated free sheet (s)	Oct.	934	7.2	10,537	8.2
Other printing/writing	Oct.	119	2.6	1,402	4.6
Total packaging and other paper (s)	Oct.	435	−3.5	5,154	−1.9
Tissue	Oct.	446	3.2	5,083	2.8
Total paper	**Oct.**	**3,109**	**5.5**	**35,539**	**3.9**
Unbleached kraft paperboard	Oct.	1,511	7.5	17,647	6.8
Semichemical medium	Oct.	455	1.8	5,372	4.9
Bleached paperboard	Oct.	368	10.5	4,295	8.5
Recycled paperboard	Oct.	719	3.6	8,193	7.1
Total paperboard	**Oct.**	**3,053**	**6.0**	**35,507**	**6.9**
Total U.S. paper and paperboard output	**Oct.**	**6,162**	**5.8**	**71,047**	**5.4**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Sept.	4,671	5.4	57,108	5.6
Market pulp production	Sept.	624	20.2	7,517	10.7
Wastepaper consumption at paper/board mills	Sept.	1,380	9.0	16,563	8.6
Pulpwood consumption (cords)	Sept.	7,362	6.6	90,905	6.4
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Oct.	27.132	6.3	239.130[6]	5.7
Containerboard inventories at U.S. box plants and mills	Oct. 1	2,274	−11.2		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Sept.	931	−5.1	11,510	3.8
Imports of Canadian newsprint	Sept.	655	−8.3	8,312[6]	2.3
U.S. paper exports (including products)	Sept.	390	10.5	4,706	16.9
Exports of unbleached kraft linerboard	Sept.	196	21.7	2,191	20.8
Exports of woodpulp	Sept.	457	53.4	4,523	18.4
Norscan pulp inventories[4]	Oct. 31	902	−40.3		
Norscan pulp operating rates[4]	Oct.	96%	90%	97%	92%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Oct.	816	3.6	7,744[6]	4.1
Operating rates	Oct.	97%	92%	93%	92%
Inventories held by U.S. consumers	Oct. 31	1,410	−6.4		
Other paper/board shipments	Oct.	544	7.9	5,038	10.1
Woodpulp shipments (export only)	Oct.	654	11.8	6,433[6]	11.3
Operating rates	Oct	97%	95%	93%	88%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

KRAFT LINERBOARD: Limited expansion should keep the market tight

Grade structure: Unbleached kraft linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26 lb, 33 lb, 69 lb, and 90 lb/1,000 ft². Major use is in domestic corrugated container production, although about 13% of the output is exported.

Production: U.S. linerboard production is projected to rise by about 7% to more than 16.2 million tons in 1986 following the previous year's 5.2% decline to 15.2 million tons. Healthy corrugated box demand combined with strong export shipments helped by the declining U.S. dollar were the major factors for this year's rebound.

Corrugated box shipments in 1986 are forecast to be about 5% ahead of their year-ago level and reach a record 280.8 billion ft², reflecting continued strength in consumer spending. Linerboard export shipments are forecast to have risen about 22% to 2.2 million tons following a 12.2% decline to 1.8 million tons in 1985 caused by the strong U.S. dollar.

U.S. linerboard mills ran at 95% of capacity in 1986 (97% adjusted for an idle Jacksonville, Fla., mill). Even with the high operating rates, linerboard mills in 1986 had difficulty keeping up with demand. Containerboard (including corrugating medium) inventories at box plants and mills had dropped to around 2.1 million tons Dec. 1—a decline of more than 450,000 tons since the start of 1986; the lowest level since early 1981.

Capacity trends. In addition to strong demand, slow capacity growth has been responsible for the tight market. Linerboard capacity rose only 2.0% in 1986 and is forecast to increase 1.5% in 1987 and 1.6% in 1988, according to the latest American Paper Institute capacity survey.

Not a single new machine is scheduled for startup, although Willamette Industries Inc. will be converting a corrugating medium machine to production of linerboard at its Albany, Ore., mill in 1987. In addition, the Jacksonville mill, with its 350,000-tpy liner machine, is scheduled to be reactivated under the name Seminole Kraft Corp. in March 1987. It has been idle since the fall of 1985 but not removed from capacity figures.

Some analysts say that a linerboard price of more than $400 is needed to justify a new linerboard mill or machine. Incremental expansion, however, may make actual capacity growth somewhat higher than forecast. A number of mills have indicated plans for adding multi-ply formers, high-pressure presses, and recycled fiber lines.

Future outlook: Slower economic growth in 1987 caused by weakness in consumer and capital spending is expected to result in only about a 2% increase in corrugated box shipments. Linerboard production, however, is expected to rise by close to 3.5%, reflecting stronger growth in export shipments and some inventory building at U.S. box plants.

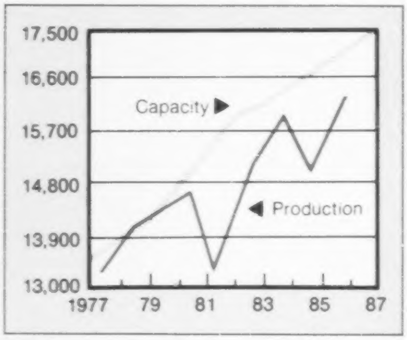
U.S. export shipments are projected to rise about 6% to about 2.3 million tons. Shipments to Europe are expected to decline slightly because of increased use of wastepaper-based test liner. This should be more than offset by higher export shipments in 1987 to the Far East, which last year accounted more than 37% of U.S. linerboard exports compared with about 28% for Europe.

Pricing: The moderate rise in demand combined with slow production growth should result in an operating rate of about 97% for U.S. linerboard producers in 1987. This should be high enough to enable linerboard producers to push through a $30/ton increase to $350 in January—returning prices to their previous peak reached in the third quarter of 1984. Another increase to around $380 is possible in the second half of 1987 or early 1988.

For this to happen, however, corrugated box prices must begin to rise in 1987. Through the third quarter of 1986, box prices had only risen 2.1% from their low point earlier in the year, while linerboard prices had climbed about 28%.

(Historical year-end prices for 42-lb liner delivered in the eastern U.S. open market are as follows: 1986, $320; 1985, $250; 1984, $350; 1983, $290; 1982, $250; 1981, $270.)

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1985	1986e	1987e
Production	15,183	16,265	16,835
Capacity[1]	15,183	16,265	16,835
Utilization rate	90.7%	95.2%	97.2%
Imports[2]	51	70	75
Exports[2]	1,807	2,190	2,320
Apparent U.S. consumption	13,427	14,145	14,590
lb/capita	112.2	117.1	119.7
GNP ratio	3.74	3.85	3.89

e = Estimate.

1. 1986 American Paper Institute capacity survey
2. Commerce Dept.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container	2,045[1]	11.9
2. International Paper	1,600	9.4
3. Weyerhaeuser	1,350	7.9
4. Union Camp	1,270	7.4
5. Temple-Inland	1,150[2]	6.7
6. Georgia-Pacific	1,120	6.6
7. Jefferson Smurfit	800[3]	4.7
8. GNN	760	4.5
9. PCA	665	3.9
10. Willamette	660	3.9

Market share of top five companies:
43.4%

Market share of top ten companies:
66.9%

Total U.S. capacity (1986):
17.078 million short tons

1. Includes 49% stake in Seminole Kraft mill (350,000-tpy linerboard) scheduled to be reactivated.
2. Included 50% interest in Georgia Kraft Co. and recently acquired Orange, Texas, linerboard mill.
3. Includes 50% interest in recently acquired Container Corp. of America mills.

per Mills Inc. Maine's Dept. of Environmental Protection would not issue a permit for startup because the warm water discharged from the mill would harm brook trout in Little Androscoggin River.

The 70-tpd industrial tissue mill, which was to be called Falls Tissue Inc., has been down for several years. Pejepscot had said it would invest $500,000 to comply with federal pollution control limits but said equipment needed to comply with Maine's DEP standards would have been too costly. ■

LITIGATION

Measurex, Impact patent battle now settled

Measurex Corp. and Impact Systems Inc. settled out of court litigation over a caliper patent. Under the agreement, Impact retains the patent for the Therma-Jet cross-direction caliper control system, granting Measurex a nonexclusive, nontransferable license to make, use, or sell any devices covered under the patent. In return, Impact is guaranteed access to Measurex communication links at reduced fees, to be used with Impact's actuators.

■ The U.S. federal Court of Appeals has upheld a lower court's ruling that **Voith GmbH**'s Flexonip press and Profilroll have not infringed **Beloit Corp.**'s patents covering the company's Extended Nip press. Beloit originally brought the suit against Voith and Chesapeake Corp. when Chesapeake decided to use the Flexonip press at its mill in West Point, Va. ■

EQUIPMENT

Combustion Engineering makes offer for AccuRay

Combustion Engineering Inc. has offered to acquire AccuRay Corp. for $147 million, or $35 per share for AccuRay's 4.2 million shares outstanding. The buyout offer was preceded by a meeting between officers of both companies and is reportedly friendly.

The offer requires that 51% of AccuRay's shares must be tendered. Combustion Engineering has been steadily buying high-technology companies as it divests itself of oil and gas equipment interests. ■

CAPACITY

API forecasts 1.8% annual rise in capacity

U.S. paper and board companies remain conservative about bringing online more capacity in most grades over the next three years, with just 4.2 million short tons to be added during 1987-89 for a 1.8% average annual advance, reported the American Paper Institute's latest annual capacity survey.

The figures toward the end of the survey period could change, however, depending on the performance of the economy and other factors over the next two years, according to API's senior vice president, Norma Pace. About 42% of the planned capacity is to be added in 1987 and smaller amounts will come during 1988-89.

The survey, Pace noted, was conducted during mid-1986, at a time when the industry was uncertain about the effects of tax reform on industry cash flow, as well as a time of concern about market prospects earlier in the year. With the tax bill finally enacted in a form not as tax-burdened as original versions and with earnings on the upswing in the final two quarters of last year, long-term investment plans could change in the coming months.

"The dollar has helped this industry," said Pace, referring to a sharp rise in export acitivity in 1986 and a "cresting" in imports. "It has made it apparent that, with a lower dollar, our competitiveness is good. Just give us a break and we'll show what we can do," she continued. In addition, Pace noted, the industry's output this year in the domestic market has doubled the 2.5% rise in gross national product (GNP).

Newsprint capacity flat. Paper capacity is expected to rise by an average of 2.4% annually during 1987-89 compared with 2.7% per year during 1977-86, while paperboard capacity will increase 1.3% per year compared with 1.6% per year during the preceding ten-year period. Of these grades, newsprint will remain relatively flat, rising by just 109,000 short tons during the period. Capacity for packaging

Growth trends in U.S. capacity (000 short tons) as forecast by API.

	Additions 1977-86		Additions 1987-89	
	10-year increase	Average annual growth	3-year increase	Average annual growth
Total all grades paper & paperboard	**12,110**	**1.7%**	**4,218**	**1.8%**
Total paper & paperboard	14,311	2.1	4,218	1.8
Total paper	8,892	2.7	2,756	2.4
Newsprint	1,845	3.8	109	0.6
Printing/writing	6,469	3.8	2,307	3.5
Packaging & industrial converting	(429)	(0.7)	(63)	(0.4)
Tissue	1,008	2.0	402	2.4
Total paperboard	5,419	1.6	1,462	1.3
Unbleached kraft	3,934	2.4	881	1.6
Solid bleached	540	1.3	104	0.8
Semichemical	770	1.5	126	0.8
Recycled	174	0.2	351	1.3
Construction grades	(2,200)	(6.7)	—	—
Total all grades woodpulp	**9,960**	**1.8%**	**1,643**	**0.9%**
Total woodpulp[1]	10,795	2.0	1,659	0.9
Dissolving & special alpha	(127)	(0.8)	—	—
Sulfite	(712)	(3.4)	(114)	(2.3)
Sulfate & soda*	9,758	2.4	1,324	1.0
Semichemical	223	0.5	(47)	(0.3)
Mechanical	1,653	3.2	496	2.7
Construction paperboard	(835)	(6.1)	(16)	(0.6)

1. Excluding pulp for construction paper and board.
*Includes screenings. ( ) = Decline.

Outlook '87

THE U.S. PAPER INDUSTRY RECOVERY EXPECTED TO CONTINUE THROUGH 1987

But gains may be smaller as inventory building slows and overall economic activity remains sluggish; will merger fever begin to cool?

Paper industry profits are expected to continue relatively strong in 1987 as a carryover from 1986, but gains will likely be less dramatic, said analysts, paper company officials, and industry observers responding to *Pulp & Paper*'s annual survey.

"We've got paper and board production up 2% next year, after 5% [in 1986]," said Rodney Young, vice president of Resource Information Systems Inc. "We've got growth starting up again in the last part of 1987 as the economy picks up after a severe slowdown over the next three quarters."

Sherman Chao, an analyst with Salomon Bros. Inc., said the U.S. paper industry should continue to outperform the U.S. economy. "This is because the lower U.S. dollar exchange rate, coupled with modestly higher economic activity, will create sufficient demand to keep operating rates near the mid-90% level," Chao said.

Yet record production volume and operating profits could obscure the continuing, but slowing, dramatic restructuring of ownership, management, and corporate strategy now under way in the paper and forest products industry.

MORE RELUCTANT BRIDES? "Still more reluctant brides are likely to be dragged to the corporate merger altar in the years ahead by unsolicited but determined suitors," claimed Clarence W. Brown, vice president with Shearson Lehman Bros.

Growth in paper and paperboard supply is expected to equal the predicted growth in real gross national product (GNP) between 1.8% and 3.0%, most analysts and industry people agreed. In addition, industry exports are expected to rise faster than imports, gaining 3.1% in 1987, after increasing 5.1% in 1986.

Production of paper and paperboard will continue to advance, about 3% over 1986, said Norma Pace, economist and senior vice president of the American Paper Institute. "Growth in paper production, particularly printing-writing grades, will be paced by improvement in retail sales and in consumer goods production," she said.

The year 1986 was a year of acquisition for many companies as Brown so colorfully pointed out. International Paper Co. bought Hammermill Paper Co., James River Corp. purchased Crown Zellerbach Corp., and Jefferson Smurfit Corp. and Mead Corp. went on spending sprees. The same held true for a number of industry suppliers, such as Harnischfeger Corp.'s purchase of Beloit Corp.

But changes in the 1987 tax regulations probably will cool acquisition fever, said Bruce Kirk of Goldman Sachs. The new tax provisions apply capital gains tax (34%) to the corporation gain and also on the proceeds to shareholders, he explained.

In addition, companies' redepreciation of acquired assets based on revaluation to the purchase price now incur higher taxes. Kirk thinks that higher taxes will drive up the cost of acquisitions, which would take away money from maintenance capital requirements for older, acquired properties.

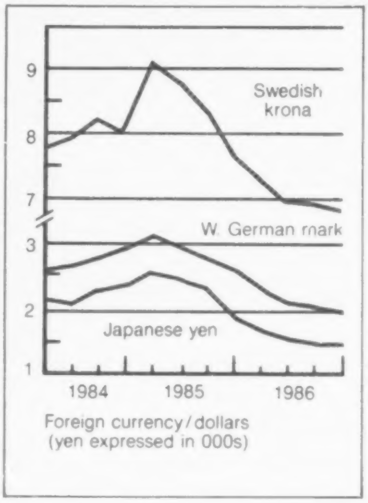
The trend toward expansion probably will mean fewer but stronger (that is, larger) players in the U.S. paper industry, said John B. Fery, chairman and president of Boise Cascade Corp. Though the smaller mills will lose out, Fery believes that the U.S. paper industry will be stronger and more competitive in the world market as a result.

Gary Palmero of Oppenheimer & Co. warned that after 1987 the threat of foreign takeovers of paper companies will be higher. "The U.S. corporate tax rate of 34% in 1988 will be one of the lowest in the industrialized nations," he said.

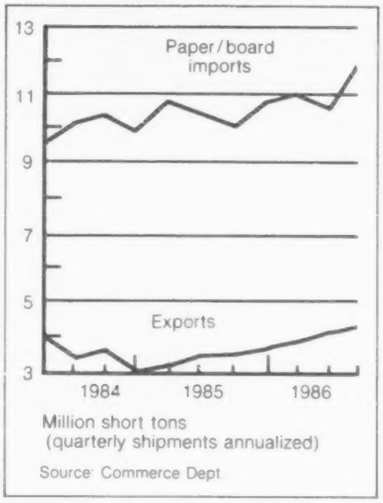
That trend already has started on a smaller scale. Settsu Paper Board Mfg. Co Ltd. purchased a minority interest in Caraustar Industries Inc., as did Mitsubishi in Beloit. And in November, Kanzaki Paper Mfg. Co. acquired Ludlow Corp.'s Specialty Papers Div. plant in Ware, Mass. The Ludlow plant produces thermal printing papers, a segment expected to continue substantial growth.

Outlook '87 was prepared by Pulp & Paper's news staffers, Debra Adams Garcia, Rob Galin, Karen Swenson, Regina McGrath, and Will Mies.

The decline of the dollar against other currencies . . .

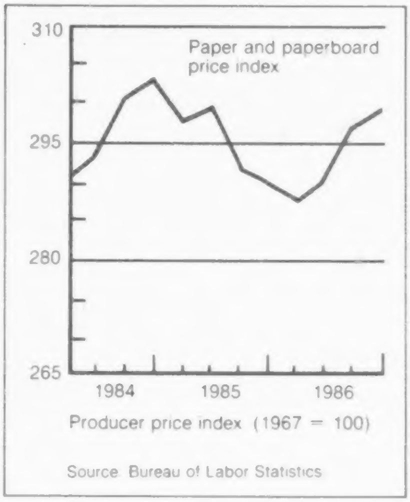


. . . boosted U.S. paper exports and slowed imports . . .



Source: Commerce Dept.

. . . helping to lift prices in the U.S. market



Source: Bureau of Labor Statistics

TABLE 1: **Analysts' projections for 1987.**

Percentage change from 1986 levels
(unless otherwise indicated)

	Growth in real GNP	Paper/board production	Operating rates[1] Paper	Operating rates[1] Paperboard	Prices	Costs per unit output[2]	Operating profits Paper	Operating profits Forest products	Housing starts[3]
George Adler Smith Barney	2.4	2.9	93.3	95.7	10[4]	2-3	32	41	1.7
Evadna Lynn Merrill Lynch	1.9	1.9	92.2	92.6	6.2	1.1[5]	34	20	1.7
Mark Rogers Prudential-Bache	0.0	2.3	92.6	94.3	10.1	4.0	34	40	1.8
Lawrence Ross Paine Webber	2.6	3.75	93	94.4	3-4	0	45	38	1.7
Sherman Chao Salomon Brothers	2.0-2.5	2.5-3.0	93	94	12.5	0-2	50	10	1.6-1.7
William Wigder First Boston	2.0	2.9	92	95.5[6]	3-5	3-4	15	25	1.7
Clarence W. Brown Shearson Lehman	2.0	2.0	91.5	93.0	5	2	20	5	1.7
Gary Palmero Oppenheimer	2.4	2.4	92.1	93.5	6.5	0	40	25-30	1.65
Tom Clephane **Jeanne Carroll** Morgan Stanley	1.8	2.9	93.0	94.5	5-6	2.5	38	n.a.	1.75
Average	2.6	2.6	92.5	94.2	7.0	1.8	34	25.8	1.71

1. Production as percent of capacity. 2. Weighted for full year. 3. Millions of units. 4. Excludes coated. 5. Paper operations. 6. Includes Seminole Kraft.

TABLE 2: **Estimated industry operating rates.**

Paper	**1984**	**1985**	**1986e**	**1987e**
	Operating rates (%)			
Newsprint	94.7%	93.8%	96.3%	96.3%
Uncoated groundwood	92.4	87.8	94.3	100.0
Coated paper	97.2	87.9	91.2	90.0
Uncoated frees & bristols	90.8	91.9	95.6	93.6
Thin paper	100.0	84.4	72.5	70.3
Cotton paper	79.5	77.0	79.0	79.4
Unbleached kraft	92.8	87.1	88.8	91.8
Tissue	93.9	92.4	92.1	90.2
Total paper percent change	93.4%	90.5%	93.1%	92.6%
Paperboard				
Linerboard	97.2%	91.1%	95.6%	97.0%
Other	88.1	84.8	90.8	92.0
Total	96.6	90.6	95.2	96.6
Semichemical	98.9	94.0	97.2	98.5
Bleached board	96.9	90.9	94.6	94.6
Recycled	90.3	87.6	90.6	89.4
Total paperboard percent change	95.4%	90.4%	94.3%	94.7%
Total paper and paperboard percent change	**94.4%**	**90.4%**	**93.7%**	**93.7%**

e = Estimates.
Source: Prudential-Bache Securities.

SLOW CAPACITY GROWTH. Expansion also came through modernization and capital spending programs, which added about 1.5 million tons for a total of 75.9 million tons of paper and paperboard capacity in the U.S. in 1986. In 1987, another 1.9 million tons will be added, according to API's new capacity survey.

Expansion is expected to continue along these lines and through renovation of existing equipment. "Capital spending in the industry will continue to be aimed primarily at improving quality and cutting costs," commented Boise Cascade's Fery.

"'Buy,' rather than 'build' will continue to be the the watchword for growth in the industry. The present returns just don't justify the capital expenditure required to build new capacity," Fery said.

The analysts agreed with Fery. It takes about $3 of capital to generate $1 of sales, said Thomas P. Clephane, a principal with Morgan Stanley. "We believe that major expansion projects in most paper grades are not warranted by near-term financial return, particularly with repeal of the investment tax credit," he said.

Pace also agreed. "The effects of tax reform on plant and equipment spending in particular will have to be closely monitored. The change is so large as to create a major uncertainty in the outlook," she said. Pace said unit labor costs will rise only moderately, if at all.

MODERATE ECONOMIC GROWTH. Senior financial executives of major U.S. firms expect the U.S. economy to enjoy at least two more years of moderate economic growth, according to the Conference Board.

Growth in real economic activity will average 2.7% in 1987 and 2.8% in 1988. Neither recession nor inflation were predicted by members of the Conference Board panel.

The overall economy will feature stronger growth than in 1986, with little inventory buildup, and fewer economic fluctuations, said economist Michael K. Evans. The reasons for this include a declining trade deficit and capital spending should increase 3% to 4% in real terms.

But even a high average for the Dow Jones index does not necessarily mean more revenue for the companies, which instead will rely on external sources of money for financing needs.

Real average corporate profits should be about 9% in 1987. In addition, interest rates will move up slightly, with the prime rate moving from 7.8% to 8.2% between 1987 and 1988.

The U.S. dollar may continue to weaken, probably about 7% between the fourth quarter of 1986 and final quarter of 1987, said Evadna Lynn of Merrill Lynch Pierce Fenner & Smith Inc.

The Japanese yen and German mark probably will remain strong against the dollar at 145 to 160 yen to the dollar and 1.85 to 2 marks/dollar, said Chao of Salomon Bros. The Canadian dollar will remain about 72¢ to the U.S. dollar.

MORE PROTECTIONISM? Canada again will be the primary source of imports into the U.S. Pulp and newsprint shipments from the North will increase as domestic U.S. demand rises, said Goldman Sach's Kirk.

All respondents felt that trade frictions will be the most important political question affecting the industry. Heightened protectionist activity could begin to alter trade patterns in 1987, Kirk said. The countervailing duty slapped on Canadian softwood lumber in October could encourage paper and paperboard companies to seek similar measures on what Kirk called "blatant" Canadian paper industry subsidies.

In addition, a dumping challenge may be brought against certain European coated paper exporters to this country. Meanwhile, the European Community late last year was still studying alleged linerboard dumping by U.S. and other foreign suppliers.

The fall of the dollar helped boost exports of U.S. pulp and paper through the third quarter of last year almost 15%. Linerboard exports were posting a 23.4% rise through the third quarter of 1986, probably reflecting some inventory building overseas. Relative exchange rate variations have meant that European and Japanese buyers have not experienced real import price hikes.

MIXED GRADE OUTLOOK. Coated papers and linerboard are expected to be the two most closely watched areas for the paper industry in 1987. Some grades could see price increases. "I think coated will still be weak," said William Wigder, analyst at First Boston Corp.

"The industry will not have much difficulty in raising prices of newsprint, corrugated boxes, kraft linerboard and bag paper, bleached board, and uncoated white paper (although the uncoated free-sheet environment could deteriorate with higher levels of imports)," said Lawrence Ross of Paine Webber Mitchell Hutchins Inc.

Most analysts hedged on the future of market pulp prices because of uncertainty about exchange rates and about how much of the current strong demand is going into inventory. Longer-run uncertainties for market pulp include capacity additions in developing countries and rapid expansion of chemi-thermomechanical pulp capacity.

UNCOATED FREE SHEET

WILL DEMAND KEEP UP WITH SUPPLY?

■ Uncoated free-sheet grades could benefit this year from continued economic growth or succumb to price pressures if the economy turns sour, analysts said. "I think the uncoated grades will be the grades most sensitive to the economy in 1987," said Mark Rogers of Prudential-Bache. But Rogers was generally optimistic that price increases for uncoated free-sheet grades will go through. Norma Pace, economist with the American Paper Institute, said the outlook for printing/writing papers will depend in large part on consumer spending. "Growth in paper production, particularly printing/writing grades, will be paced by improvement in retail sales and in consumer goods production," Pace said.

Production of uncoated free-sheet should rise about 5.4% in 1987 from last year, API estimated. This is higher than the average increase of all grades of 2.5%.

Even more optimistic than the analysts were industry executives. "Even though the demand might not increase as much, it will increase, and we think prices are going to continue to improve through 1987. Operating rates will be, in the worst case, very good, and in the best case, they'll be outstanding," said Gene Cartledge, chairman, president, and CEO of Union Camp Corp. Operating rates for uncoated free-sheet mills were projected at 91.4% by Gary Palmero of Oppenheimer and at 95% or more by Evadna Lynn of Merrill Lynch.

Cartledge is optimistic for 1987 because of past growth. "This market has grown almost 3 million tons in the last four years, or about 8% a year since 1982. It was at about that rate last year," he said. Even with new capacity, growth at 3% to 4% a year would give the industry an operating rate of 93% to 94%, Cartledge said. If growth matches previous years, operating rates could reach 95% to 96%, he said.

TABLE 3: **Estimated industry production.**

Paper	**1984**	**1985**	**1986e**	**1987e**
	Production (000 tons)			
Newsprint	5,539	5,427	5,641	5,700
Uncoated groundwood	1,563	1,502	1,529	1,590
Coated paper	6,227	5,861	6,217	6,700
Uncoated frees & bristols	10,146	10,642	11,498	11,700
Thin paper	338	275	227	220
Cotton paper	140	144	147	150
Unbleached kraft	5,557	5,210	5,129	5,200
Tissue	4,921	4,941	5,073	5,100
Total paper	34,431	34,001	35,461	36,360
Percent change	4.9%	−1.2%	4.3%	2.5%
Paperboard				
Linerboard	16,032	15,242	16,280	16,800
Other	1,147	1,192	1,338	1,365
Total	17,179	16,434	17,618	18,165
Semichemical	5,162	5,084	5,372	5,475
Bleached board	4,059	3,972	4,291	4,350
Recycled	7,858	7,701	8,108	8,200
Total paperboard	34,259	33,190	35,389	36,190
Percent change	7.2%	−3.1%	6.6%	2.3%
Total paper and paperboard	**68,689**	**67,195**	**70,850**	**72,550**
Percent change	**6.0%**	**−2.2%**	**5.4%**	**2.4%**

e = Estimates.
Source: Prudential-Bache Securities.

George Treier, principal engineer at Xerox Corp.'s Paper Technology Center, told *Pulp & Paper* there is quite a bit of activity in uncoated free-sheet. "We really see a fair amount of capacity coming on board, but we see increased demand as well. The question is which is going to exceed which." Treier said that in the short term new capacity will create a competitive market for mills. "[But] we're not necessarily tied into having a buyer's market," he said. Over the whole year Treier does predict a slight price increase.

Rogers, in his latest industry quarterly report, estimated that production of uncoated free-sheet and bristol grades will rise to 11.7 million tons in 1987, up about 2%, or 11.4 million tons, in 1986. Imports into the U.S. are expected to fall almost 18%, though domestic demand will be up about 1%. Exports, Rogers said, should be up about 21%, but they represent a very small fraction of paper production.

Groundwood papers are not likely to make much of a dent in sales of free-sheet grades for reprographic and computer printouts for the next few years, at least, Treier said. In fact, there is a trend toward more expensive rag bonds for archival use in some sectors, he said. Groundwoods could be made that eventually would find a niche among free-sheets, but the cost of technology could be high and added free-sheet capacity will help deter such activity for the time being, Treier suggested.

On the technical side the trend toward greater automation will continue in the areas of cross direction, alkaline sizing, and reducing paper variability. However, Treier said there is not likely to be a trend toward a greater number of types of paper available. Improvements will include resistance to contamination, better surface strength, and improved copy quality, Treier said. But costs of paper will not go up because of these technological changes, and in fact they may go down as they reduce papermaking costs in some areas. For example, cross-directional control and uniformity will help reduce the amount of waste and rejected paper. Alkaline sizing also has the potential for cost reductions, Treier said.

COATED PAPER

NEW CAPACITY WILL MAKE 1987 DIFFICULT

■ Though most paper grades are looking at a stable, if not profitable year, analysts generally expect coated papers to continue their slump, and maybe even lose some ground in pricing.

Prices for coated groundwoods began firming in the second half of 1986, and two-month backlogs were reported on offset grades. One paper company even announced a price hike of $40/ton for better grades beginning Jan. 1, 1987.

Still, "the one grade with mediocre near-term prospects is coated papers," said John B. Fery, chairman and CEO of Boise Cascade Corp. "With additional capacity due in 1987, supply will continue to outpace demand."

Analysts put it more pessimistically: "We believe that a best-case forecast for coated paper is that there is no further erosion from current levels, which are down approximately 12% from late 1985 peak levels," said Thomas P. Clephane of Morgan Stanley & Co. Inc.

"I remain skeptical of the outlook for coated papers for the next couple of years," said Mark Rogers of Prudential-Bache. Added George Adler of Smith Barney: "I think coated No. 5 will go down another notch in early '87." Gary Palmero of Oppenheimer went even further by suggesting that LWC grades that were selling for around $720/ton in the last quarter of 1986 could fall to $660/ton.

Clephane believes coated mills will have an average operating rate of 89% because of the plentiful paper supply. An 85% operating rate was projected by Evadna Lynn of Merrill Lynch.

However, Rodney Young of Resource Information Systems Inc. was slightly more optimistic about coated papers. "Coated papers will do very well after the 1985 debacle and average 7% growth in the period 1986 to 1988, but prices will remain relatively flat from the fourth quarter of '86 through 1987," he said.

While prices of coated magazine grades will fall, premium grades—Nos. 1 and 2—are expected to rise and middle grades—Nos. 3 and 4—could go either way, said Lawrence Ross of Paine Webber.

This pessimism comes at a time of rising demand, at least for coated groundwood papers. Use of lightweight coated grades could rise almost 5% a year through 1995, according to a study by Jaakko Pöyry Group of Helsinki, Finland, in cooperation with Walker Wiener Associates U.S., and Walker Watson Associates, U.K.

Most of those supplies will come from domestic producers, with only about 3.4% coming from other countries, an analyst said.

A majority of publishers are keeping paper inventories of 31 to 60 days, with more than 26% keeping 61-90-day inventories. The rest have a supply for a month or less.

FIVE NEW MACHINES. Coated papers could benefit in 1987 from increased use by magazine publishers. A survey by the Magazine Publishers Assn. revealed that publishers expected paper use to rise 3.7% in 1987 from its 1986 level, following a 2.1% rise in 1986 from the year before.

Coated groundwoods will remain the dominant coated grades used by publishers. It will account for over 70% of coated paper used in 1986 and 1987.

But a recent report by the Publishers Information Bureau said magazine advertising pages continued to fall, posting a 1.4% decrease for the first ten months of 1986 as compared with the same period a year earlier. That downward trend did slow in October, but analysts suggested that probably was due to Christmas season advertising. (Ad revenues grew during that same period because of rate hikes.)

However, lightweight coated papers and supercalendered grades will face a new challenge by an in-between grade of pigmented paper that does not have the gloss of LWC, but it has greater opacity than SC. Finnish mills are leading the way on this new paper.

The biggest problem for the U.S. coated paper market are new machines which started up last year—but which will be making their full impact felt in 1987. These include new coated groundwood machines started up by Bowater Inc., Consolidated Papers Inc. and International Paper Co. and a new coated free-sheet machine started up by Scott Paper Co. totaling nearly 800,000 tons.

TABLE 4: **Average paper prices, uncoated papers.**

	1984	1985	1986	1987
IQ	760	688	664	700
2Q	764	688	671	740
3Q	751	682	687	740
4Q	717	662	700	740
Average	748	680	681	730
% change	10	−9	—	7

Source: Prudential-Bache Securities.

In addition, Repap Enterprises Ltd. last year started up a new 200,000-tpy machine in Canada, and the company will be targeting a good portion of the machine's output at the U.S. market.

TISSUE

PRICES SHOULD IMPROVE

■ While it is unclear whether producers will get behind a price hike, cut back on promotional programs, or narrow discounts, U.S. tissue producers may finally be successful in raising prices for consumer tissue this year. "With pulp prices increasing, there certainly is an impetus for some form of a price increase," noted analyst Jeanne K. Carroll of Morgan Stanley & Co.

Little new consumer tissue capacity is expected to come onstream this year. Most of the new capacity in 1987 will be in the commercial and industrial segment of the tissue market, and C&I producers have already covered themselves by implementing a 5% price increase last fall.

In April Fort Howard Paper Co. will start up the first of four recycled tissue machines at its $1-billion Savannah River mill in Rincon, Ga. No. 16 will have capacity for 250 tpd, most of which will end up in the C&I segment. In the fall Georgia-Pacific Corp. plans to retire an old machine by starting up a new one at its Palatka, Fla., mill, increasing capacity by about 100 tpd. This new production will be split between consumer and C&I areas. American Tissue Co. plans to convert Diamond International Corp.'s idle molded pulp mill into an integrated tissue mill late this year.

Demand has been good. Tissue production through September was running at a 5.064-million-tpy rate, up 2.48% from 1985, according to the American Paper Institute. Tissue imports through August were up 14.75% from the year-earlier period at an annualized rate of 64,250 tons.

OVERCAPACITY IN 1988? Tissue producers may have to worry about overcapacity down the road, observed Smith Barney, Harris Upham & Co. analyst George Adler. Fort Howard, the largest U.S. C&I tissue producer, is in the process of more than doubling tissue output by 1993. According to analyst Jeanne Carroll, the company is adding about 665,000 tons of capacity during the 1983-93 period, which she estimates is about two thirds of the total tissue market's anticipated growth.

TABLE 5: **Average paper prices, coated papers.**

	1984	1985	1986	1987
IQ	910	1,030	1,000	970
2Q	934	1,030	970	970
3Q	970	1,030	970	970
4Q	970	1,030	970	970
Average	946	1,030	978	970
% change	15	9	−5	−1

Source: Prudential-Bache Securities.

James River Corp., a leader in the consumer segment, announced late last year that it was planning to start up three tissue machines in the next five years. It is believed that not all of them will represent new capacity since some older machines will probably be idled. This comes on top of the startup last year of a 70,000-tpy tissue machine at the company's Naheola, Ala., mill.

The overall tissue industry operating rate has been flat: 92.4% in 1985 and about 92.2% last year. U.S. tissue capacity is expected to grow about 2.6% in 1987, 2.5% in 1988, and 2.0% in 1989, according to the API's recent capacity survey. This works out to an average annual growth rate of 2.36% for 1987-99, representing an additional 402,000 short tons of capacity, not including James River's new machines.

CONTAINERBOARD

TIGHT SUPPLY AND RISING PRICES

■ Most forecasters look for further growth in U.S. corrugated box shipments in 1987, which should result in tight supply and additional increases in containerboard prices.

Roger W. Stone, chairman and CEO of Stone Container Corp., told a recent meeting of the Assn. of Independent Corrugated Converters that he expected corrugated box shipments to increase just under 5% to 280 billion ft^2 in 1986 and then rise another 3.5% in 1987 to 290 billion ft^2. Norma Pace, senior vice president of the American Paper Institute, at the same meeting projected a 6.1% increase to 283.7 billion ft^2 in 1986 and a further 3.3% rise in 1987 to 293 billion ft^2.

Not all forecasts are as optimistic. William Copeland of Copeland Economics told the Second International Unbleached Kraft Conference, sponsored by *Pulp & Paper*, that he expects a 1.8% decline in corrugated box shipments in 1987 because of slower economic growth in the second half.

While most forecasts envision 2% to 3% growth in corrugated box shipments, containerboard capacity will grow at a much slower rate. Linerboard capacity is expected to grow at only a 1.2% average annual rate over the 1986-89 period, according to one recent API survey. If kraft paper is included with linerboard—both grades are produced on some swing machines in the industry—the rate of growth comes down to 0.7%/year, Roger Stone noted.

WHERE WILL SUPPLY COME FROM? The question for 1987 may be: how will U.S. containerboard mills keep up with demand? Additional supply cannot come out of inventories since stocks at the end of 1986 were at rock-bottom levels after a record two-year liquidation. Some improvement, however, is possible in industry operating rates, which averaged in the mid-90% range in 1986. And some additional capacity will be entering the market from the reactivation of the 490,000-tpy Jacksonville, Fla., liner/kraft paper mill by this coming March.

Some pullback in export markets is possible in 1987 because of slower economic growth, inventory building by some offshore buyers last year, and competition from recycled board. "Linerboard exports will be hampered by the lack of increased demand from Japan and the lower (30% to 40%) cost of test linerboard in Germany, two key markets for linerboard," noted Evadna S. Lynn of Merrill Lynch.

But even with some improvement in production and less robust export demand, U.S. linerboard mills may have to struggle to keep up with demand. Linerboard prices in the eastern U.S. last year climbed from about $250/ton at the beginning of the year to $320 in the fall. Another increase to $350 has been announced for early 1987. Mark S. Rogers of Prudential-Bache projects that prices could rise to $380 by this fall "before a final increase to well over $400/ton occurs some time in 1988."

If this is going to come about, the industry will have to do a better job of raising corrugated box prices this year than last. Through the third quarter of last year, corrugated box prices had risen only about 2% as measured by Fibre Box Assn.'s index, while linerboard prices had climbed 26%.

POOR RISK/REWARD. Such an improvement in pricing is needed by the industry to justify major new capacity expansion. Not a single new linerboard mill has been built in the U.S. since 1980 due to unfavorable return on investment. "No right-thinking businessman would spend the money necessary to bring in significant additional capacity unless he believed that the price for linerboard would achieve $450/ton, three years from the time the decision was made to build, and would have the probability of remaining at that level for some protracted period of time," Stone said.

Rather than build new capacity, containerboard producers have been buying each other in a major industry restructuring. "It is still far cheaper to buy good capacity in place than it is to built it, according to Stone.

Recent examples include the Jefferson Smurfit Corp.-Morgan Stanley acquisition of Container Corp. of America, the Pomerantz-Hayford investment group's acquisition of Gaylord Container Corp., Stone Container's acquisition of effective control of Jacksonville Kraft Paper Co., and Great Southern Paper Co.'s partial integration through the purchase of J&J Corrugated Box Corp.

The merger and acquisition fever may result in a stronger industry with fewer decision makers—but it has done nothing to add to supply.

BOXBOARD

FLAT BUT FIRM MARKETS

■ Boxboard producers ended 1986 on a good note, with prices up from a year earlier and another increase on bleached board posted by two major producers for January. With capacity increases expected to be minimal over the next three years and demand projected to remain relatively good in 1987, markets should remain at least as good as in 1986.

Demand for bleached board was strong in 1986, with the first three quarters showing an 8.4% advance over a year earlier. This was caused in part by a surge in export orders as the dollar rose in comparison to other currencies through the year. But that situation could change in 1987 if the dollar falls off significantly.

Recycled board markets were not as strong. However, producers were able to get prices up $20 to $30/short ton during the fall after a failed attempt earlier in the year. Prices for 20-pt clay-coated recycled board in rolls began the year at $350/400 and by year-end stood at $380/420. The change in 20-pt bending chipboard in rolls during that time was from $300 in January to $320 by December.

Recycled mills did well, though, despite the market's dependency on domestic demand because recycled products are not a significant export item. Through the first nine months of the year compared with a year earlier, production was up 7.3%, though production for export was down 8%. This compares with bleached board production for export rising by 10.2%.

SBS HIKE POSTED FOR JANUARY. Bleached board producers fared far better than recycled manufacturers on the pricing front also. They were able to get prices up twice. A $30/ton increase posted in April in the East brought transaction levels up to $570/600. In the West, prices went up in May to $600/650. Another increase of $30 to $40/ton in July boosted prices further to $570/625 in the East, while West Coast prices stabilized.

On top of these increases, Westvaco Corp. and Federal Paper Board Co. Inc. both plan another jump in January of about 4%.

Bleached board capacity is expected to grow just 0.8% annually through 1989, while recycled board capacity will increase 1.3% per year during the same period. As recently as late 1985, market observers felt recycled board markets would strengthen due to a lack of expansion through 1988 and bleached board markets were expected to languish because of a 3.1% annual jump in capacity during 1986-88, according to the American Paper Institute's 1985 survey. But the situation is now reversed. SBS supplies are expected to be tight in 1987.

Recycled board producers, on the other hand, have had more to contend with than lagging prices. Profits have also been hurt by sharply higher wastepaper prices. Costs escalated substantially during the past year, but producers were unable to get compensation from sufficient price improvement and will be trying to raise levels in 1987.

OUTLOOK VARIES AMONG END-USES. The outlook within the recycled board market should vary somewhat in 1987, though the overall forecast calls for a relatively flat year. Demand for gypsum wallboard facings should remain good, though down somewhat from the past two years when construction activity was high. Demand this year is expected to be level or down slightly from 1986 due to much of the pent-up demand for housing and commercial space having been met for some time to come. Many areas now have excess capacity in multifamily housing and office space.

Test linerboard and recycled corrugating medium demand should remain relatively strong, provided the dollar does not weaken sufficiently to curtail export demand for virgin board. Folding carton demand, which is the largest end-use for recycled board, should continue to lose market share from competitive materials. The market share loss should not be significant in 1987, however, with recycled board prices expected to remain significantly below competitive products as bleached board and solid unbleached board.

JUICE, OTHER USES HELPING CARTONS. In bleached board, milk carton demand should be relatively strong. The erosion in markets caused by plastics over the past 15 years appears to have slowed considerably in recent years. Containerboard producers have found alternate markets, such as with juice manufacturers and in other uses, such as water and oil containers, which have made up for a significant portion of the loss.

The most promising market for bleached board, however, appears to be in the aseptic area. International Paper Co., though, so far has been the only U.S. producer to compete in that market as a supplier of aseptic board. The majority of the packaging material is imported from Scandinavia and Fed. Rep. Germany and converted in the U.S. That situation could change as early as in this year, though, as more food manufacturers begin to devise ways to apply the board to their products.

Plate and cup stock consumption should remain steady in 1987. Consolidation of the disposable cup industry with purchases in 1986 by James River Corp. and Fort Howard Paper Co., however, could cause some interesting competitive moves this year.

TABLE 6: **Corrugated box prices have been lagging containerboard increases.**

	Eastern U.S. price 42-lb linerboard[1] ($/short ton)	Average U.S. corrugated box price[2] ($/1,000 ft^2)
1986		
3Q	$310/320	$38.54
2Q	280/290	38.00
1Q	250/260	37.73
1985		
4Q	250	38.14
3Q	250	38.86
2Q	275	41.35
1Q	310	42.56
1984		
4Q	320/350	42.60
3Q	320	40.82
2Q	320	40.87
1Q	290/320	38.62
Peak to valley drop (1984-85)	−25.4%	−11.4%
Valley to present rise (1985-86)	+26.0	+2.1

1. Source: *Pulp & Paper Week*. 2. Source: Fibre Box Assn. index.

WASTEPAPER

MORE STABLE PRICES EXPECTED

■ Wastepaper markets picked up substantially in 1986, with prices more than doubling for some grades in some parts of the country, as well as for export tonnage. Exports again broke the record set in 1985, while demand from domestic mills through the first eight months was 8.6% above prior year levels due in part to a sharp rise in linerboard production.

In addition, pulp prices increased three or four times during the year.

Whether or not paperstock will repeat this performance in 1987 is uncertain. But most market observers expect demand to be at least flat or slightly higher than in 1986. The dollar is not expected to rise enough to cause any significant erosion in export demand. But forecasts call for a 3% advance in the U.S. economy in 1987, according to the Conference Board's forum of 14 top U.S. analysts. This should keep a lid on prices through much of the year.

Problems incurred by paperstock dealers and buyers in recent years with laser printing and hotmelt glues will continue to plague the market. Mills are expected to continue to reduce consumption of grades containing these contaminants, and this should especially affect such grades as computer printout.

Meanwhile, state and local governments continue to threaten recyclable paper supplies as waste-to-energy plants multiply. The industry, however, will remain committed to lobbying efforts to ensure private enterprise's access to adequate supplies from the solid waste stream.

A number of mill projects in the East are likely to firm markets there. Fort Howard Paper Co. is said to be gearing up for the startup of a tissue paper machine at its Rincon, Ga., mill in 1987, which would require ledger

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grades. Also, Chesapeake Corp. is scheduled to restart the converted No. 1 paper machine at its West Point, Va., mill late in 1987. It will produce recycled corrugating medium and use old corrugated containers (OCC) and some double-lined kraft (DLK).

PACIFIC RIM WILL BE KEY AREA. In the West, the big pull for paperstock should come from the Pacific Rim countries, market observers indicated. One broker expects total U.S. paperstock exports will advance by 3% to 4%.

Through the first three quarters of 1986, exports were up 12.9% over a year earlier. Rep. Korea and Taiwan should draw a good portion of overseas demand. India's consumption should continue to grow and Indonesia should advance some in the coming year.

Canada will be relying more on paperstock from the U.S. as the gap between domestic supply and demand continues to widen. In addition, Europe is expected to come out of its slump and will be ready to buy paperstock again soon.

Third-quarter prices for paperstock in Europe fell sharply from the second quarter. In France and Fed. Rep. Germany, a turnaround was seen unlikely until 1987. To exacerbate the situation, Italy was buying supplies from the U.S. instead of France, while Fed. Rep. Germany was shipping to north and east France. In the U.K., sources said prices stopped falling in the third quarter, although lower grades were still available at distressed prices.

In the U.S., meanwhile, paperstock markets were beginning to show signs of weakness in November. Prices for such key grades as computer printout (CPO) and new DLK corrugated clippings were dropping. Old corrugated containers and No. 1 news were also weak. One dealer in the Northeast said CPO fell $30 late in November. OCC and old news each were down $10 to $15. DLK dropped about $10.

In all cases, prices weaknesses were caused by oversupplies as mills cut back on orders to trim inventories for the normal year-end slowdowns.

UNCERTAIN SIGNS TOWARD YEAR-END. The decline was so sudden and so sharp that dealers were unsure if markets had turned down for the long-term or were just experiencing the normal year-end glitch. One broker, though, said when paperstock markets rise as rapidly as in 1986, they fall as fast.

But the pulp substitute grades were holding up in November despite their significant climbs during most of the preceding ten months. A pulp price increase announced by some producers for Jan. 1 was said to be helping.

Observers noted that if pulp prices continue to advance in 1987, pulp substitutes will follow. This, in turn, would boost levels for other grades as mills search for cheaper alternatives in a market of rising prices.

CANADIAN INDUSTRY

STRONG MARKETS SHOULD BOOST PRICES, OPERATING RATES, COMPANY PROFITS

Rising protectionism, intensified competition in global markets and changing government sentiment toward industry should cause some concern for Canadian pulp and paper mills this year. Markets, however, look more favorable in 1987, following an upturn in 1986.

The decline of the Canadian dollar in relation to European currencies boosted demand from overseas buyers for Canadian products, although the U.S. dollar declined at about the same time, keeping the exchange rate between the two countries on about a par with 1985. The drop in Canadian currency, though, was timely for the market in general as it occurred when pulp prices began to firm early in 1986 due to increased demand and production curtailments.

A lengthy strike in British Columbia by the International Woodworkers of America caused some slight production problems at mills there in the third and fourth quarters but did not depress industry profits. In fact, margins improved in the third quarter from a year earlier for many companies and the fourth quarter was expected to show about the same results.

In eastern Canada, paper and forest products companies generally improved their performances in the third quarter of 1986 from the previous quarter and from a year earlier by as much as 61%. The strong earnings performance was attributed to the increase in pulp prices, improved operating rates for newsprint, better prices for most paper grades, and the weak Canadian dollar.

COMPANY EARNINGS TO ESCALATE. Earnings of most eastern pulp and paper companies are expected to double in 1987 and post more moderate gains in 1988, according to Brian Topp of Capital Group Securities Ltd. He noted that the threat of strikes in the eastern region, where negotiations are focused this year, should keep markets strong.

The IWA strike in British Columbia, which began in mid-July and continued well into the fourth quarter, surprised industry observers as it came on the heels of a prior settlement with the industry's Canadian Paperworkers Union and Pulp, Paper & Woodworkers of Canada unions, which was reached quickly and without any labor disruptions.

The trend, though, has been toward moderation in labor demands. Industry, on the other hand, has been able to win more concessions in such areas as work rules and statutory downtime. Settlements more favorable to industry are expected to follow again in 1987, although an upturn in markets could raise union expections early in the year.

Low mortgage rates in the U.S. and Canada kept the wood products industry operating at a good pace in 1986, although there was some slowdown later in the year as pent-up demand for housing seemed to have slowed. Housing starts are expected to be about flat in 1987 from 1986 in the U.S. However, a 15% duty imposed on Canadian softwood lumber imports into the U.S. will somewhat curtail demand for Canadian lumber.

The Canadian industry called the duty unjustified but U.S. counterparts felt Canadian producers had been unfairly subsidized in most provinces. A final decision on the amount of the tariff was to be determined by Dec. 30. Meanwhile, the dispute could thwart efforts at reaching a free trade agreement between the two countries. It is doubtful that U.S. protectionist sentiments will die out yet this year as worldwide competitiveness remains keen. Others fear a trade war between the two countries may occur.

TRADE WITH U.S. IMPORTANT. The portion of secondary fiber used at Canadian mills continued to escalate in 1986, causing them to have to look outside for supplies and rely more on the U.S. During the first half of the year, Canadian mills used 12% more recyclable paper than a year earlier, according to the Canadian Pulp & Paper Assn. Of that total, 500,000 tons had to be imported from the U.S.

Like their U.S. counterparts, Canadian pulp and paper companies underwent a considerable amount of reorganization in the past year. Perhaps the biggest move was made by the Quebec government, which announced it would divest its interests in Donohue Inc. and Domtar Inc. Bidders were being reviewed and an initial announcement was expected by late in the year.

Another key movement toward reorganizing the industry centered on British Columbia Resource Investment Corp.'s decision to get out of the pulp business. In June, it sold its Prince Rupert, B.C., pulp mill to Repap Enterprises, and in September it sold its Castlegar, B.C., pulp mill to a consortium consisting of Canada's Power Corp., Consolidated-Bathurst Ltd., and People's Rep. China.

The sale of the two BCRI mills also reflected a trend toward investment by foreign companies and those outside the region, as well as the continued expansion of entrepreneurs such as George Petty of Repap. Others that have emerged in recent years include Dan Alexander of St. Marys Paper Inc., and the Lemaire family of Cascades Inc.

CONSOLIDATION TO CONTINUE. The industry is expected to continue its consolidation into the hands of fewer owners. Meanwhile, larger companies will be pooling their resources into more capital expenditures to improve their competitive position. And older equipment will be replaced with more advanced models.

The Canadian government, however, will probably remain tightfisted with its money for subsidizing any improvements, acquisitions, and greenfield mill projects. Funding is being given less frequently, and when it is it's usually in the form of participatory loans rather than outright grants.

This government policy was the result of protests from within the industry itself. Additional capacity was being brought online—a considerable portion of it funded by government grants—at a time when markets could not absorb it. With markets improving, however, government sentiment could change in 1987.

NEWSPRINT

DEMAND, PRICES UP; CAPACITY FLAT

■ North American newsprint producers should have a good year in 1987. Prices are expected to move up by as much as $65/metric ton. North American capacity should rise only about 1%, and U.S. consumption will be up an estimated 2.5%. This should bring mill operating rates to about 95% this year and more than 97% by 1989.

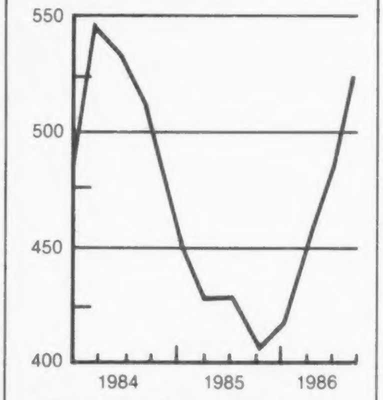
The market will be starting out the year with a price increase announced for Oct. 1 by most producers, but posted for Jan. 1 by Champion International Corp. and Kimberly-Clark Corp. This $35/ton hike to $570 was partially implemented at the beginning of the last quarter of 1986 but was not expected to take full effect until early in 1987.

This would be the first price increase for the industry in more than two years. The last hike, to $535, was posted for July 1984, but it took until later in the year to be fully implemented. Then markets began to erode again in 1985 and steep discounting set in late in the year and continued through much of the first half 1986.

But by June it became apparent the market was turning around for the long-term, and North American producers began to line up behind an attempt to raise prices on Oct. 1. Most major producers—except Champion and K-C—announced by Aug. 1. By Oct. 1 markets had firmed sufficiently to implement the increase for some contract orders, but a large amount of tonnage was still being discounted from list prices. At the time, the transaction price rose to $500/570 from $500/535 in the East and $483/570 from $483/535 in the West.

The price increase had received support not only from Champion and K-C both announcing identical hikes for Jan. 1 just prior to the Oct. 1 date, but also from continued increases in newsprint demand through the summer months. By the end of the first nine months, total U.S. consumption was up 3.5% from a year earlier, according to the American Newspaper Publishers Assn. U.S. production was up somewhat higher than Canadian output: 2.8% compared with 2.1%.

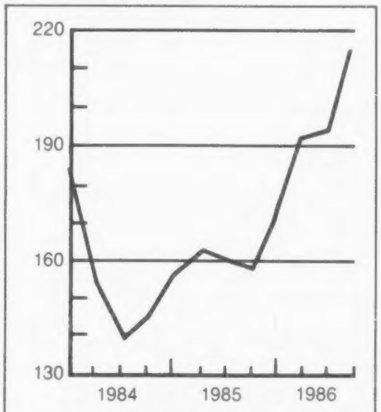
The upsurge in market pulp prices . . .



▲ Price for northern bleached kraft pulp delivered in U.S. ($/metric ton)

Source: *P & P Week.*

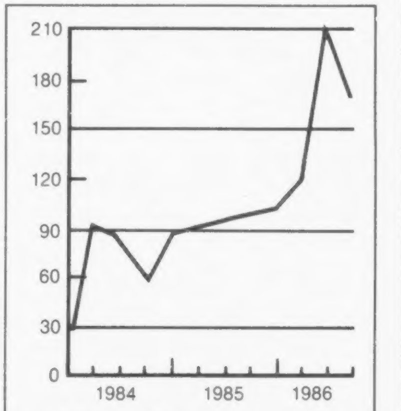
. . . plus steady firming in lumber prices . . .



▲ Canadian spruce/pine/fir lumber in U.S. ($/000 bd ft)

Source: *Random Lengths.*

. . . have revived profits of Canadian companies



▲ Profits of six major companies: Abitibi, BCFP, Canfor, Con-Bath, Domtar, MacBlo (C$ millions)

WESTERN REGIONS TO REBOUND FIRST. The U.S. and Canadian western regions are likely to experience the greatest firming this year and were already strong in the second half of 1986 due to various factors. In addition to a strike in the third quarter at the Port Alberni, B.C., mill of MacMillan Bloedel Ltd., a lockout at Tasman Pulp & Paper Ltd.'s New Zealand mill at about the same time caused tonnage from Crown Forest Industries Ltd.'s Campbell River, B.C., mill to be diverted offshore to Tasman's markets. Later in the quarter, the North Pacific Paper Corp. mill in Longview, Wash., was directed to increase shipments to Japan.

But by the fourth quarter, spot tonnage at depressed prices was becoming increasingly more difficult to find even in the East. Newsprint producers reported order backlogs at the end of October were out through year-end. Yet some publishers continued to get price protection through December and beyond in some cases. Newsprint prices are expected to firm closer to the $570 list by January, but larger buyers will continue to get concessions.

Industry analysts expect that the discounts, however, will be reduced significantly by the first quarter of 1987, and they will continue to narrow through the remainder of the year. Jeanne K. Carroll of Morgan Stanley, New York, projects a narrowing in the discounting to 5% if the price increase takes effect, as expected, in January. She forecasts a further reduction in discounts to 3.5% and another $30/ton price increase in January 1988.

ANOTHER PRICE INCREASE POSSIBLE. Brian Topp of Capital Group Securities Ltd., Toronto, is more optimistic about the newsprint market's comeback in 1987. He expects the Oct. 1 increase will be firmly in place by early 1987 and another $30/ton hike should be posted as early as April.

Topp notes that with consumption expected to rise while capacity stays relatively flat, it will be a seller's market again in 1987. In addition, the spring timing is appropriate because labor contract negotiations involving most eastern Canadian mills are expected to start at that time (see related article).

George B. Adler of Smith Barney, New York, expects newsprint production will increase in 1987 by 1.8% to 5.125 million tons, and operating rates should reach 96.6%. Carroll forecasts newsprint output at U.S. mills in 1987 will be 5.04 million tons and the operating rate will be 95%.

A consensus of forecasters call for U.S. newsprint consumption to rise about 2.5% in 1986, 2.8% in 1987, and 2.5% in 1988. At the same time, mill operating rates should rise to 92% in 1986, 94.5% in 1987, 96% in 1988, and 97.5% in 1989.

Despite projections for better markets in 1987, U.S. producers will continue to experience market share erosion in North America from overseas competitors. Should the dollar remain strong, the competition will be less severe but is likely to continue to make inroads at a moderate rate. Should the dollar drop in relation to other currencies, however, more significant erosion could occur.

Through the first three quarters of 1986, U.S. newsprint supplies from sources outside Canada and the U.S. amounted to 254,725 tons, up 7.4% from a year earlier. This amount accounted for 2.9% of total U.S. consumption compared with 2.8% in 1985.

For the long-term, newsprint markets should be strong through the rest of the decade. In addition to no significant capacity additions planned for North America through the 1980s, new product innovations and a growing share of nonnewspaper end-use applications should result in a 2%/year growth in standard newsprint usage, according to a recently completed report by Jaakko Pöyry International Oy of Helsinki, Finland.

UNCOATED GROUNDWOOD

NEW LWC CAPACITY MAY BE A PROBLEM

■ Uncoated groundwoods are expected to see a favorable, though less than ecstatic, year, analysts and papermakers say. "On balance it should be a reasonably good year, depending on newsprint pricing," said Jim Rowland of Canadian Paper Analyst.

Pricing in general will be up marginally, but there will be a price squeeze on lightweight coated (LWC) grades which could put pressure on nearby uncoated grades, Rowland said. Yet word came at the end of 1986 that prices would rise, based on similar actions in free-sheet grades earlier in the last quarter of 1986. Last December Abitibi-Price Inc. announced an across-the-board, $40/ton price hike for its groundwood forms grade papers, the same as some free-sheet hikes.

Canada will increase production and also shipments into the U.S. Rowland suggested that about 80% of Canadian uncoated groundwood shipments go to the U.S., with 10% staying in Canada and another 10% going offshore.

Market size in 1986 was about 3.5 million metric tons for all grades: supercalendered (SC), roto news, directory, lightweight catalog, and softcover book news, said Warren Woodworth, senior vice president for marketing at CIP Inc.

Through 1990 growth will average about 3% annually, with SC growth faster than machine-finished grades, according to CIP estimates. The tonnage volume for SC is a fairly large segment of the total and is related to retail sales, Woodworth said. "We're coming into an overall market condition with supply and demand very much more in balance than has been the case," he added.

However, Canadian mill officials will be looking over their shoulders by 1988 when a new high-end 250,000-tpy SC machine at Lake Superior Paper Industries in Duluth, Minn., comes online. LSPI is owned by Pentair Inc. and Minnesota Power. There also will be competition from Scandinavian clay-filled WSOP supercalendered paper, produced under license by Abitibi at its 59,000-tpy Kenogami mill in Jonquiere, Que.

There has been an ongoing, but slow, process of paper machine conversions in Canada. Abitibi is converting its Alma, Que., mill's newsprint machine to 47,000 tpy of lightweight catalog and directory paper. St. Marys still is planning on installing a new 156,000-tpy SC machine at Sault Ste. Marie, Ont. And CIP is expanding in SC production at Trois Rivières, Que., by 110 tpd.

The industry also will see an ongoing change in product mix. There also is potential for ownership changes at Donohue Inc. and British Columbia Forest Products Ltd.

Some U.S. retailers and publishers are buying more and more paper in Canada, printing their inserts there, and then shipping the completed jobs to the U.S. for distribution in direct mail and newspaper insert campaigns. For instance, K-Mart buys from 10% to 20% of its paper in Canada. This is because SC stock is harder to come by in the U.S., a K-Mart spokeswoman said. Magazines and supermarket tabloids are following a similar pattern. Canadian paper is cheaper and printing is done on state-of-the-art equipment. U.S. customers pay Canadian market prices, which are not at the U.S. equivalent, but lower, a source said.

Overall prices will depend on what happens to newsprint pricing, said CIP's Woodworth. He predicted 1987 will probably be good for groundwood specialties because newsprint consumption in 1986 was running 3% ahead of 1985, even with one less Sunday last year. In addition, Canadian groundwood mills are starting to see better sales offshore, especially in western Europe.

In specific segment areas, CIP predicts growth in the preprint area at 7%-plus annually, 10%-plus for business forms, and 10%-plus in heatset offset printing paper, said Colin Russell, CIP's manager for market planning in newsprint and pulp.

Woodworth said in the decade ahead papermakers will be looking at ways of extending raw material, electricity, wood, and even people. For instance, CIP is producing more paper with fewer people, having dropped the number of employees from 16,000 to 12,000. Papermakers will have to work on improving quality and answering customers' needs, Woodworth said.

MARKET PULP

WHEN WILL THE PARTY END?

■ The pulp market underwent a dramatic recovery in 1986 that few in the industry would have predicted just a year ago.

U.S. and Canadian market pulp mills by last fall were running full out (except for a few mills affected by the British Columbia woodworkers strike). North American and Scandinavian producer inventories of chemical paper-grade market pulp had dropped to a rock-bottom level of only 900,000 metric tons. And pulp prices rose each quarter, with the price of benchmark northern bleached softwood kraft rising from about $390/metric ton at the end of 1985 to $520 in the fourth quarter—for about a 33% increase. Already producers were in the process of announcing another increase for Jan. 1 which should take the price to about $550 to $560/ton.

HELP FROM THE DOLLAR. Will the party continue? Ross Hay-Roe of *PaperTree Letter* points out that most pulp market upcycles since the 1950s have lasted for six to eight quarters, suggesting that the current upturn may have a bit further to go. No doubt some customer inventory building is taking place, with U.S. and Canadian market pulp shipments for the first nine months up nearly 10%. Most of this inventory building has probably been in overseas markets. (The only available statistics on consumer stocks are for the U.S. and show only a moderate increase.)

A major factor affecting the strength of the market will be the value of the dollar in relation to other currencies. The declining dollar took most of the pain out of last year's price increases for buyers in Europe and Japan and increased the cost competitiveness of North American producers vs those in Scandinavia.

Although the dollar price of pulp has increased 33%, customers in Fed. Rep. Germany have experienced only a 16% increase in terms of their currency, while buyers in Japan have had only about a 9% rise, Hay-Roe noted. The decline of the dollar has also put increased cost pressure on Scandinavian mills—and in the case of Swedish mills caused them to hold back on production.

FLAT CAPACITY GROWTH. One factor which should help the pulp market in 1987 is that North American

TABLE 7: **Market pulp producers experienced a dramatic recovery in 1986.**

	North American/Scandinavian		**U.S. market**
	Inventories (000 metric tons)	**Operating rates (%)**	**price ($/metric ton)**
1986			
3Q	920	94	$480
2Q	960	90	450
1Q	1,133	90	410
1985			
4Q	1,298	88	400
3Q	1,397	85	400/425
2Q	1,449	84	425
1Q	1,762	89	450
1984			
4Q		96	510
3Q	1,309	93	530
2Q	1,040	92	540
1Q	914	82	480

1. Producer inventories of chemical paper-grade market pulp at end of quarter.

Source: *Pulp & Paper Week.*

and Scandinavian chemical paper-grade market pulp capacity will be virtually flat for the next two years. No major new chemical paper-grade market pulp mills are planned in the Norscan countries because of recent poor profitability. However, world chemical paper-grade market pulp capacity is expected to rise at about a 1%/year rate in 1986-87 because of a somewhat higher rate of expansion growth in other parts of the world.

Even if demand for chemical paper-grade market pulp remains flat in 1987—as some industry forecasters have projected—operating rates for North American and Scandinavian mills would remain at about the same healthy 95% to 96% rate they were at last year, up from 89% in 1985.

The longer-run outlook for Norscan chemical paper-grade market pulp producers is less bright. Eucalyptus pulp has been growing in popularity, and producers in Brazil and the Iberian peninsula are studying major capacity additions. In Brazil alone, more than 1.5 million tons of capacity could be added by the early 1990s, according to Claes G. Hall, commercial director of Aracruz Celulose SA.

LONG-RUN CHALLENGES. Nontraditional producing countries are now the world's lowest cost supply regions because of low wood and labor costs and weak currencies. Aracruz last year pegged its manufacturing cost at $160/metric ton (excluding financial cost and delivery).

Another challenge for North American chemical paper-grade market pulp mills will be coming from rapid expansion of chemi-thermomechanical pulp. Four new CTMP mills started up or are planned in Canada in the 1986-88 period. The projects by Tembec Inc., Cascades Inc., Fibreco Export Inc. and Millar Western Industries Ltd. could add 600,000 tpy of market CTMP. And Consolidated-Bathurst Ltd. last year began marketing about 80,000 of bleached CTMP in North America formerly shipped to a newsprint mill in England.

A third problem facing market pulp producers is the growing use of superabsorbents in baby diapers. This could cause the roughly 1.0-million-tpy U.S. fluff pulp market—once pulpmakers' fastest growing major market segment—to level off or even decline. As a result, more U.S. and Canadian market pulp capacity could be integrated into papermaking in the future.

LABOR

NEW BARGAINING WILL AIR OLD ISSUES

The stage is set in upcoming U.S. labor negotiations for a repeat focus on the issues that were most evident during the 1986 round of bargaining. According to American Paper Institute estimates, approximately 113 mills will be negotiating new labor agreements in 1987. A shift in regional concentration will occur, with the West Coast and the Midwest now showing the heaviest levels of activity.

Labor's concerns have been influenced since the early 1980s by the recessionary economic environment, which has forced paper companies to look for ways to trim costs to remain competitive. For the union worker, this has meant contracts that have included the addition of flexible work rules, cost-containment medical programs, elimination of premium pay scales, and the unrestricting of holidays.

Richard P. Klinzing, vice president of employee relations for the American Paper Institute, terms these recent negotiations: periods of "corrective bargaining." He feels that many of the work practices and restrictions that were part of the paper industry's collective bargaining process during the past 20 years have been modified or eliminated and expects that this mode will continue.

In addition, he said, mills must deal with increased competition from countries such as Brazil, with low labor costs that U.S. mills are unable to match. This means that U.S. paper companies will have to move away from focusing on wage issues. Although, in his opinion, easily identifiable monetary items will still be scrutinized, companies will have to branch out in other directions such as instituting "team concept" work rules to gain a competitive edge.

He feels that companies will continue to focus negotiations on this goal of increased flexibility with the expected end result being increases in productivity. This move toward a concentration on other than monetary issues, in his view, is and will continue to be one of the most important parts of the negotiation process.

UNION VIEWS ISSUES. Members of the United Paperworkers International Union (UPIU) see many of the issues that are part of the current bargaining practice as management's attempts to take back items that were won in past negotiation efforts.

Gordon Brehm, executive assistant to the UPIU president, agrees that items such as medical costs, flexibility, and premium pay will continue to be issues. He feels, however, that in the case of medical benefits, for instance, companies have shifted costs to the worker rather than opt for containment policies such as mandatory second opinions.

He feels that flexible work rules will continue to be

TABLE 8: **Major contracts by region on 1987 U.S. paper industry bargaining calendar.**

Company	Mill location	Union	No. of employees	Contract expires
Pacific region				
Southwest Forest Ind.	Snowflake, Ariz.	U	425	2/28
Boise Cascade	Wallula, Wash.	W	391	3/14
Weyerhaeuser	Cosmopolis, Wash.	W	280	3/14
Weyerhaeuser	Springfield, Ore.	W	391	3/14
Weyerhaeuser	Everett, Wash.	W	189	3/14
Weyerhaeuser	Longview, Wash.	W	976	3/14
Weyerhaeuser	North Bend, Ore.	W	146	3/14
Boise Cascade	St. Helens, Ore.	W	474	3/14
Boise Cascade	Vancouver, Wash.	W	293	3/14
Grays Harbor	Hoquiam, Wash.	W	269	3/15
International Paper	Gardiner, Ore.	W	229	3/14
ITT Rayonier	Hoquiam, Wash.	W	265	3/15
ITT Rayonier	Port Angeles, Wash.	W	360	3/15
Georgia-Pacific	Bellingham, Wash. (Pulp & Chem.)	W	363	4/30
Georgia-Pacific	Bellingham, Wash. (Tissue)	W	331	4/30
Georgia-Pacific	Toledo, Ore.	W	432	4/30
Simpson Paper	Ripon, Calif.	W	149	4/30
Boise Cascade	Steilacoom, Wash.	W	177	5/31
Champion	Missoula, Mont.	U	740	5/31
James River	Antioch, Calif.	W	167	5/31
Longview Fibre	Longview, Wash.	W	1,418	5/31
Packaging Co. of Calif.	Red Bluff, Calif.	W	240	5/31
Scott Paper	Everett, Wash.	W	1,045	5/31
James River[1]	West Linn, Ore.	W	507	5/30
Potlatch Corp. (Consumer Products)	Lewiston, Idaho	U	360	6/30
(Pulp & Paperboard)	Lewiston, Idaho	U	665	6/30
Keyes Fibre	Sacramento, Calif.	U	225	9/11
Louisiana-Pacific[2]	Antioch, Calif.	U	273	10/29
New England region				
Champion	Bucksport, Maine	U,A,B,O	1,033	5/1
S.D. Warren Co.	Westbrook, Maine	U[3],A,B,O	1,262	5/31
Haverhill Paperboard	Haverhill, Mass.	U	139	6/1
International Paper	Jay, Maine	U,O	1,204	6/1
James River	Berlin, N.H.	U	1,246	6/24
Georgia-Pacific	Gilman, Vt.	U	180	7/1
James River	Hyde Park, Mass.	U	165	7/1
Federal Paper Board	Versailles, Conn.	U	184	7/10
James River	Fitchburg, Mass.	U	34	7/31
		O	419	8/9
Boise Cascade	Brattleboro, Vt.	U	149	8/31
Georgia-Pacific	Woodland, Maine	U,A,B,O	521	8/31
Madison Paper	Madison, Maine	A	289	9/15
James River	Old Towne, Maine	U	759	9/30
Fraser Paper	Madawaska, Maine	U,O	914	11/1
Midwest region				
Niagara of Wisconsin	Niagara, Wis.	U,O	502	1/31
Consolidated Packaging	Fort Madison, Iowa	U	221	7/31
Consolidated Papers				
(Stevens Point Div.)	Stevens Point, Wis.	U,A,B,O	194	4/30
(Wis. River Div.)	Stevens Point, Wis.	U	470	4/30
(Biron Div.)	Wis. Rapids, Wis.	U,A,B,O	656	4/30
(Kraft Div.)	Wis. Rapids, Wis.	U,A,B,O	286	4/30
(Wis. Rapids Div.)	Wis. Rapids, Wis.	U,A,B,O	1,156	4/30
Georgia-Pacific	Kalamazoo, Mich.	U,O	312	4/30
Gilbert Paper	Menasha, Wis.	U	275	4/30
Crystal Tissue	Middletown, Ohio	U	253	5/1
Scott Paper	Marinette, Wis.	U	729	5/14
Scott Paper	Oconto Falls, Mich.	U	157	5/30
Nicolet Paper	DePere, Wis.	U	366	5/31
Dunn Paper	Port Huron, Mich.	U	192	6/1
Packaging Corp.	Rittman, Ohio	U	263	6/1
Jefferson Smurfit	Middletown, Ohio	U	130	6/1
Menasha Corp.	Otsego, Mich.	U,O	176	6/13
Mosinee Paper	Mosinee, Wis.	U	456	6/30
Fletcher Paper	Alpena, Mich.	U	157	6/30
Stone Container	Coshocton, Ohio	O	217	7/1
Pope & Talbot	Eau Claire, Wis.	U	366	7/14
Inland Container	Newport, Ind.	U	93	7/14
Pope & Talbot	Ladysmith, Wis.	O	163	7/31
Stone Container	Ontonagon, Mich.	U	221	7/31
Beckett Paper	Hamilton, Ohio	U	387	9/28
Gaylord Container	Baltimore, Ohio	U	84	9/30
Packaging Corp.	Tama, Iowa	U	72	10/2
Sorg Paper Co.	Middletown, Ohio	U	414	11/1
Midtec Paper	Kimberly, Wis.	O	1,000	11/30
Southern region				
International Paper	Mobile, Ala.	U,B	1,264	1/31
International Paper	Moss Point, Miss.	U,B	881	3/31
Westvaco	Covington, Va.	B		3/1
Westvaco	Luke, Md.	B		3/1
James River	Richmond, Va.	U	213	4/28
ITT Rayonier	Jesup, Ga.	U,A,B,O	909	6/30
Bowater Southern	Calhoun, Tenn.	U,B	1,157	7/2
Federal Paper Board	Augusta, Ga.	U,B	722	8/14
Champion	Canton, N.C.	U	1,613	8/31
International Paper	Pine Bluff, Ark.	U,B	858	9/1
Georgia-Pacific	Monticello, Miss.	U	375	9/30
James River	St. Francisville, La.	U	737	10/22
Eastern region				
P.H. Glatfelter	Spring Grove, Pa.	U	845	1/19
Manning Paper	Troy, N.Y.	U,A,B,O	156	3/31
Riegal Products	Hughesville, N.J.	U,B	53	5/30
Riegal Products	Milford, N.J.	U,B	380	5/30
(James River)	Warren Glen, N.J.	U,B	161	5/30
Lyons Falls	Lyons Falls, N.Y.	U	227	6/1
Hammermill Paper	Lock Haven, Pa.	U	740	6/20
James River	Carthage, N.Y.	U	328	6/30
Scott Paper	Chester, Pa.	U	1,300	9/27
Garden State Paper	Garfield, N.J.	U	192	9/30
International Paper	Corinth, N.Y.	U	484	9/30
Georgia-Pacific	Plattsburgh, N.Y.	U	504	10/1
Appleton Papers	Roaring Springs, Pa.	U	401	11/17

Legend: U = United Paperworkers International Union; W = Assn. of Western Pulp & Paper Workers; A = International Assn. of Machinists & Aerospace Workers; B = International Brotherhood of Electrical Workers; O = Others.

1. Reopener possible. 2. Reopener. 3. Settled Nov. 9, 1986.

Source: American Paper Institute Employee Relations Dept.

an issue but says that the majority of mills where this concept has been a problem have had these contract changes added in recent years. In his opinion, though, further changes will have to be made before a truly workable system is arrived at.

He stated that in recent years, paper companies have been able to take advantage of unions weakened by declining membership and an antiunion political climate. In the past, companies insisted on seven-day work weeks, and firms were willing to pay workers for serving on these extra shifts. He feels that there is "no economic justification" for many of the companies' recent demands.

LUMP SUM SETTLEMENTS THE RULE. In a trend that seems destined to remain a part of industry bargaining, API statistics show that over three-quarters of the labor contracts negotiated during 1986 contained lump sum payments to workers in the first year in lieu of general wage increases.

In most cases, increases were deferred until the second or third year of the contract term. This, of course, is more beneficial for companies in maintaining a lower wage base and also in reducing the multiplier effect on benefits and pensions in any existing year.

The effect that these lump sum bonuses had on the wage increase percentage for the past year is readily apparent. Through the first of November, according to API statistics, the annual percentage wage increase for 1986 was 0.3%, compared with 2.1% for the whole of 1985.

POWER OF STRIKES REDUCED. In a recently issued report, the Conference Board expects that unemployment will remain unchanged from current levels in 1987, holding at a rate of 7%. This high unemployment, along with other related economic factors, has made it more difficult for unions to benefit from staging a strike.

Companies are thus finding it easier to hire temporary or in some cases permanent replacements and are able to run mills with these new hires and salaried employees to help lessen the impact of a strike. And in the case of several strikes during 1986, most notably at Boise Cascade Corp.'s Rumford, Maine, mill, striking workers finally returned to their jobs after accepting contracts that differed little from the companies' final offers.

CANADIAN BARGAINING SHIFTS TO EAST. The largest number of Canadian mills negotiating new labor contracts in 1987 will be in the eastern half of the country. The Canadian Pulp & Paper Assn. (CPPA) calendar shows that a large percentage of the existing contracts will expire on Apr. 30.

As in the past, according to industry officials, the pattern of bargaining will be set using one target company as a "model." James Buchanan, president of the Canadian Paperworkers Union (CPU), stated that negotiations will begin in earnest after the CPU's National Wage Policy Conference in mid-January. At this conference, he said, the union will set some bargaining strategy.

According to Buchanan, the number one concern for Canadian union members during negotiations this year will be maintaining their job security in the face of continued technological change and modernization programs. Flexible work rules will also be an issue, as it was during the bargaining in British Columbia in 1986. He said in Canada, though, the flexibility issue becomes a question of mill operating time rather than a disposition of the work force as it is in the U.S.

He also expressed concern about the ongoing strike activity by the International Woodworkers of America (IWA) in British Columbia over the issue of contracting out work at those mills. He felt that the outcome of that situation could have repercussions on what the CPU will be faced with as bargaining begins in the East.

Buchanan said that an issue outside the regular bargaining activity will be the subject of pension plans. In 1982, the union met with Abitibi-Price and agreed on a separate settlement governing pensions. This agreement expired this past fall. Preliminary discussions had again begun with Abitibi when the company asked to break off talks in expectation of the passage of country-wide government reforms which would have an effect on pensions. Buchanan expected that this new legislation could pass and become law as of Jan. 1, 1987.

MANDATE GIVEN TO EXPLORE MERGER. In another development that will have a profound effect on future bargaining activity, Buchanan said that the CPU executive board was given the go-ahead by delegates at a September convention to explore the feasibility of merging with another union. A similar proposal had been rejected by union membership in 1982.

Buchanan termed the merger proposal, "a move to survive," in the face of reduced membership caused by technological change and the rising administrative costs necessary to maintain services. He said that the IWA had received a similar mandate from its members. These mandates, he said, have opened the door for preliminary discussions that will continue through the end of 1987.

When asked what had been the most significant change that had occurred since the last round of talks in 1984, he said that it was an improvement in the Canadian paper industry. This has resulted in an increased profitability for the companies as evidenced by the recent rise in the price of newsprint which has been accepted in the marketplace. It is, he explained, a "better arena now" for bargaining.

And on another positive note, Buchanan noted that the modernization that has occurred in Canadian mills has enabled a reduced workforce to produce more tonnage. Rather than signifying a loss for the union, the reduction in workers may bring about an improved situation for a smaller number of workers who will share in the subsequently increased profits. ■

FINISHING/CONVERTING

WILL STRONG TREND CONTINUE TOWARD PRECISION SHEETING FOR FOLIO SIZES?

Record 1985 folio sheeter purchases were a bubble, based on recent trends, but survey indicates strong momentum during next five years

By JOE RADOMSKI

The year 1985 was undoubtedly the biggest in history for the purchase of precision folio sheeters in North America, with an estimated 16 precision folio sheeters bought by U.S. and Canadian fine and coated paper producers. What happened to change the rate of acquisition from the six per year of the late 1970s? Will the new high rate of purchase continue, or was this a bubble caused by a delay in purchasing in the lean years of the early 1980s (Table 1)? Is this the beginning of a major conversion from guillotine trimming to precision sheeting of folio sizes, or will market saturation begin to set in?

To attempt to gain some insight into the future, a tabulation was made of all fine and coated paper industry sheeting locations in the U.S. and Canada to determine how many of what kind of folio sheeters they have (to the best of the author's knowledge). Then an estimate was made of what each mill might purchase by the end of 1991.

In a total count of 91 paper mills and 24 converting plants which produce folio sheets, there were at the end of 1985 in operation or purchased an estimated 81 precision folio sheeters. This figure estimate includes both first and second generation precision folio sheeters. In these same locations, a total of 223 guillotine trimmers are still in operation today.

Next, an estimate was made of the potential for converting from trimming to folio sheeting at each location. Each estimate is, of course, a judgment call, with an effort at rational judgment being made through consideration of a uniform set of factors. These considerations included what was known about (1) the amount of trimmed tonnage, (2) the skid versus carton packaging, (3) the potential economic justification, (4) the availability of funding, (5) the long-range plans for the location, (6) the current viewpoint of the plant toward folio sheeting, and (7) the current corporate viewpoint.

> *Is this the beginning of a major conversion from guillotine trimming to precision sheeting of folio sizes, or will market saturation begin to set in?*

In taking a look at economic justification it was also necessary to make a judgment of what kind of sheeter(s) would be the best fit: small (two-pocket, four-roll) or larger, and with continuous carton discharge or skids only.

CARTONS VERSUS SKIDS. It should be noted that precision folio sheeting began with continuous carton discharge. Then came a transition to skid discharge with offline carton lines as required. At this time, the paper industry is purchasing about 80% of its sheeters with carton packaging facilities for the three reasons noted below:

1. Large volume skid orders continue to be shifted to rolls with the advent of smaller web presses.

2. The increase in small (26 in. × 40 in. maximum) sheetfed presses, running short-run, high-quality jobs, appears to be causing carton orders to grow faster than overall demand.

3. Automatic cartoning machines improve the economic justification if the sheeter is large and sufficient volume exists.

POTENTIAL FOR REBUILDS. The estimate of how many new sheeters will be bought is made more difficult by the potential that exists for rebuilding existing sheeters. Included are those with cutting sections adequate in cut quality and accuracy but limited in speed, downtime, or quality by their delivery or unwind systems. These conditions

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Mr. Radomski has had 37 years of experience in paper finishing and converting operations and equipment manufacture. He has published a number of articles on paper finishing and converting.

were taken into account in the estimate by making a judgment as to which plants might rebuild existing equipment.

Two such rebuilds were recorded in the last two years, and undoubtedly more will occur. Rebuilds were not included in the new machine count in either previous year statistics or the five-year forecast.

After all the judgment calls were made, location by location, totals were calculated in each category and then 15% added to each to allow for growth in overall paper demand in the next five years.

PURCHASE RATE INCREASE. As a result, in the years 1987-91, the industry is expected to purchase folio sheeters at the rate of eight per year, an increase of 33% over the rate of the late 1970s. At the end of 1991, this would still leave 153 guillotines in operation. A five-year breakdown on the kinds of sheeters expected to be bought is shown in Table 2.

The 16 new folio sheeters bought in 1985 did constitute a bubble; it compensated for the few bought in the previous four years. At the half point in 1986, it appeared that the year would wind up with about 10 to 12 folio sheeters purchased, and probably fewer will be bought in 1987-88 as the current industry expansion tapers off.

It is interesting to note that a substantial portion of sheeters purchased in the next five years is projected to be of the "small" variety, as tonnage in small mills and residual tonnage in large mills is converted from trimming. Also, carton sheeters are expected to predominate primarily in the early years.

Since there are seven sheeter manufacturers competing in this market, competition can be expected to be fierce. This alone might make the figures presented here a bit conservative since price reductions will improve economic justification.

PRECISION SHEETING TRENDS TO CONTINUE. Conversion from trimming to precision sheeting will continue. The economics justify it. It was once estimated that as little as 20 to 25 tpd from a precision sheeter would provide an attractive payoff for the smallest sheeter now available on the market. As the trend continues, trimming will be reduced further toward the base level of customer preference and it will become necessary to produce odd or larger sheet sizes and orders too small to produce economically on an expensive precision folio sheeting system.

Indeed, as the trimmed tonnage gets smaller and the conversion cycle approaches its limits, the purchases of large high-speed folio sheeting systems will approach the lower limit in expansion of demand.

TABLE 1: **Estimated folio sheeter sales by size and type.**

	1982	1983	1984	1985	1986
Large skid			1	3	1
Large carton	1		3	7	6
Small skid		1		6	
Small carton			1		
Total	**1**	**1**	**5**	**16**	**7**

TABLE 2: **Types of sheeters purchased 1987-91.**

	Skid	Carton	Total
Large	6	17	23
Small	9	9	18
Total	15	26	41

The 16 new folio sheeters bought in 1985 did constitute a bubble; it compensated for the few bought in the previous four years.

ACCURACY OF ESTIMATES. How accurate are these estimates? The guess here is ±15% in total, maybe ±50% in any given year. The numbers are inescapable: finite locations, known tonnages, and stable and limited expansion rates result in a smaller and smaller market. The error could be in how fast the conversion occurs or on how close to 100% the conversion will get or on which kind of machines are purchased. Further, the author is handicapped with less than 100% accurate data on the industry since there are no accurate, published data currently.

But with only 90-odd locations, these errors tend to be self-correcting as the years pass for example, more sooner; fewer later. This estimate has assumed that in the next five years, no major technological breakthroughs will occur that will change the economic factors markedly in either direction. There could be a robot to operate the trimmer, or a low-cost sheeter that will run one-roll orders without stopping, or a web press to run small orders more economically than today's 26 in. x 40 in. sheetfed presses. This means that no replacement of the current generation of folio sheeters has been projected. Perhaps ten years from now this will be in evidence.

One final thought: If you disagree with these numbers, do the same estimate, starting with a detailed count of locations, and see what you come up with. The author believes the methodology is sound, and welcomes your response to discuss how we differ. ■

Outlook '87

CAPITAL SPENDING SURVEY: 1986-88

Canadian spending climbs once again, but U.S. companies are cutting back after completing some major expansion programs in 1986

By CARL ESPE, News Editor

Despite prospects for a continued rebound in sales and earnings this year, U.S. paper companies are cutting back sharply on their capital spending plans, according to *Pulp & Paper*'s annual survey of capital spending plans. Major factors in the cutbacks are uncertainties about the economy and new tax laws and the completion of a number of major spending programs in 1986. In Canada, meanwhile, pulp and paper companies are taking advantage of improved financial fortunes to boost capital spending for the third straight year.

P&P's latest survey, conducted in October and November, covers spending plans for the three-year period from 1986 to 1988. Reported capital outlays for the 1986-88 period total $6.71 billion in the U.S., down 18.8% from the $8.26 billion reported in last year's survey. In Canada, however, spending plans total C$4.40 billion for the 1986-88 period, up 7.3% from $4.10 billion last year.

Conflicting reports on U.S. plans. Capital spending won't top the $9-billion mark in 1986, but it will surpass the 1985 total, according to the Commerce Dept.'s Bureau of Economic Analysis. The BEA's most recent survey, conducted in July and August, showed paper companies shaving their spending plans back to $8.87 billion for 1986—still a new record but down 2.5% from the $9.1 billion reported earlier in the year. Capital expenditures of $8.87 billion would represent a 3.2% increase over 1985 spending of $8.59 billion.

In contrast to the Commerce report, McGraw-Hill Economics drastically reduced its estimate of 1986 U.S. paper industry capital spending in its recent fall 1986 survey of investment plans. According to the study, which was conducted in September and October, pulp and paper industry spending will plunge to $7.86 billion in 1986, a drop of 8.4% from 1985. The 1986 decline will be followed by a further decrease of 24.1% in 1987, to $5.97 billion, before a slight recovery of 2.0% in 1988 to $6.09 billion. The study is based on returns from pulp and paper companies representing 24.1% of the industry's capital spending, McGraw-Hill said. Overall, the study's forecasts total a 3.5% decline in U.S. business capital spending in 1986, followed by an increase of only 0.4% in 1987.

The fall survey results are in sharp contrast to McGraw-Hill's spring survey, conducted last March and April. In the earlier study, paper industry spending was to hit $9.20 billion in 1986—14.6% higher than the current forecast. The spring survey showed spending slowing to $8.15 billion in 1987 and $7.35 billion in 1988.

The economy is now in its fourth year of recovery, while real GNP has been mired below 3% growth for the past two years, said McGraw-Hill in explaining the pessimistic survey results. Despite the decline in the U.S. dollar, the trade deficit is still widening, and U.S. indus-

TEN-YEAR CAPITAL SPENDING TRENDS

YEAR	U.S. TOTAL		CANADA TOTAL	
1986e	$8,870	3.3%	C$2,161	16.7%
1985	8,590	19.1	1,851	57.7
1984	7,210	21.8	1,174	17.5
1983	5,920	−0.8	999	−29.7
1982	5,970	−11.2	1,420	−15.3
1981	6,720	−1.2	1,676	61.0
1980	6,800	22.5	1,041	51.9
1979	5,550	39.1	686	33.6
1978	3,990	10.8	513	−1.6
1977	3,600	15.8	521	6.4

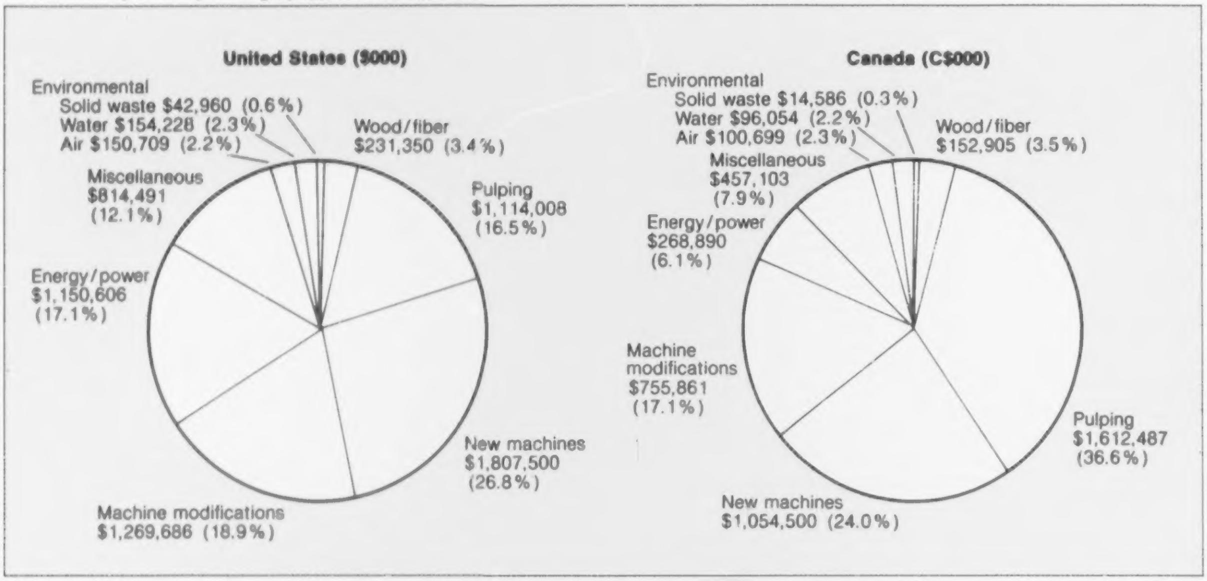
Source: Commerce Dept.; Statistics Canada.

TEN-YEAR U.S. ENVIRONMENTAL SPENDING TRENDS

YEAR	AIR		WATER		SOLID WASTE	
1986e	$211	27.1%	$160	−27.3%	$197	7.1%
1985	166	—	220	−162.8	184	327.9
1984	166	12.2	86	−44.2	43	−54.7
1983	148	55.8	154	25.2	95	30.1
1982	95	−42.4	123	−3.9	73	1,116.7
1981	165	−18.3	128	−29.7	6	−89.9
1980	202	6.9	182	23.8	59	−25.3
1979	189	27.7	147	−0.7	79	1,875.0
1978	148	−20.0	148	−31.5	4	−92.3
1977	185	−25.4	216	−46.5	52	−55.6

Source: Commerce Dept.; McGraw-Hill Economics; environmental spending totals are not available for Canada.

FIGURE 1: **Reported spending by type of facility, 1986-87 +.**



U.S.—REPORTED CAPITAL EXPENDITURES FOR 1986-88 + BY REGION AND TYPE OF FACILITY ($000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
New England	$ —	0%	$ 20,000	2%	$ 175,000	10%	$ 87,200	7%	$ 259,800	23%	$ 140,031	17%
Mid-Atlantic	275	0%	34,028	3%	—	0%	28,396	2%	149,685	13%	44,464	6%
East North Central	15,250	7%	72,308	7%	177,000	10%	653,408	52%	27,661	2%	116,808	14%
West North Central	20,000	9%	80,000	7%	217,500	12%	40	0%	50,000	4%	20,000	3%
South Atlantic	126,375	55%	433,150	39%	755,000	42%	271,522	21%	579,150	50%	240,922	30%
East South Central	51,700	22%	152,200	14%	210,000	12%	102,500	8%	45,200	4%	70,000	9%
West South Central	6,750	3%	169,000	15%	273,000	15%	58,000	5%	36,500	3%	71,319	9%
Mountain/Pacific	11,000	5%	153,322	14%	—	0	43,620	3%	2,610	0%	110,947	14%
Total	**$231,350**		**$1,114,008**		**$1,807,500**		**$1,269,686**		**$ 1,150,606**		**$ 814,491**	

ENVIRONMENTAL QUALITY SPENDING / TOTALS

	ENVIRONMENTAL QUALITY SPENDING						TOTALS					
	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENTAL		GRAND TOTAL	
New England	$ 4,000	3%	$ 1,300	1%	$ 3,200	7%	$ 682,031	11%	$ 8,500	2%	$ 690,531	10%
Mid-Atlantic	1,900	1%	—	0%	—	0%	256,848	4%	1,900	1%	258,748	4%
East North Central	12,023	8%	14,349	10%	10,660	25%	1,062,435	17%	37,032	11%	1,099,467	16%
West North Central	18,035	12%	18,000	12%	1,500	4%	387,540	6%	37,535	11%	425,075	6%
South Atlantic	98,940	64%	74,540	50%	25,660	60%	2,406,119	38%	199,140	57%	2,605,259	39%
East South Central	1,570	1%	18,540	12%	700	2%	631,600	10%	20,810	6%	652,410	10%
West South Central	3,190	2%	19,640	13%	520	1%	614,569	10%	23,350	7%	637,919	10%
Mountain/Pacific	14,570	9%	4,340	3%	720	2%	321,499	5%	19,630	6%	341,129	5%
Total	**$154,228**		**$150,709**		**$42,960**		**$6,362,641**		**$347,897**		**$6,710,538**	

+. Includes $1,205,480,000 for projects for startup in 1989 and after ($1,057,000,000 production; $147,980,000 environmental).

States are assigned to regions as follows:
- New England: Maine, Vt., N.H., Conn., R.I., Mass.
- Mid-Atlantic: N.Y., N.J., Pa.
- East North Central: Wis., Mich., Ill., Ind., Ohio
- West North Central: N.Dak., S.Dak., Nebr., Kans, Minn., Iowa, Mo.
- South Atlantic: Del., Md., W.Va., Va., N.C., S.C., Ga., Fla.
- East South Central: Ky., Tenn., Miss., Ala.
- West South Central: Okla., Texas, Ark., La.
- Mountain/Pacific: Wash., Ore., Calif., Alaska, Idaho, Nev., Mont., Wyo., Utah, Ariz., Colo., N.Mex.

try is operating at only 79% of capacity. Tax reform will also hurt investment in 1987 by reducing investment incentives, McGraw-Hill said, particularly through the retroactive elimination of the investment tax credit to the beginning of 1986.

Despite the general pessimism, McGraw-Hill called the big decline in paper industry spending "clearly surprising" considering the recent indications of good profit and sales growth, as well as high capacity utilization. Contemplated capital budget cuts for 1987 could transform into increases early in the year, the report said.

Spending up again in Canada. The recovery in Canadian capital spending that began in 1984 appears to be continuing, according to the latest survey of investment intentions by Statistics Canada. Canadian paper and allied industries plan to spend a record C$2.16 billion on capital projects in 1986, an increase of 16.7% over 1985. Capital outlays rose 57.7% in 1985 to $1.85 billion, breaking the old record of $1.68 billion set in 1981. The biggest increase is in construction outlays, which were expected to jump 43.0% in 1986 to $262.6 million. Machinery expenses were forecast to rise 13.8% to $335.2 million.

The new spending plans are also up in comparison to the survey conducted by Statistics Canada last winter. At that time, 1986 spending was forecast to reach $2.12 billion in 1986, about 2.1% below the current estimate. Observers credit better prices for pulp and most paper grades, higher operating rates for newsprint, and the weak Canadian dollar for the improved cash flow picture that is pushing up capital spending in Canada.

ABOUT *P&P*'s ANNUAL SURVEY. Now in its twenty-third year, *P&P*'s annual capital spending survey covers expansion and modernization programs at U.S. and Canadian mills. Unlike surveys which track spending by year, the *P&P* survey covers spending by project. Dollar figures represent the total cost of reported projects and may sometimes include supporting equipment. The total cost of multi-year projects is assigned to the startup year and is not divided among the years of expenditure. Each survey primarily covers a three-year period, but projects with firm startup dates beyond that time frame are also included.

Complete results of P&P's exclusive survey of North American capital spending programs for 1985-87 are available in a separate Mill-by-Mill Listings report. Organized by company, the listings show programs for new mills and machines, rebuilds and modernizations, environmental quality control, and other mill improvements, with specifics on equipment ordered, dates, suppliers, and prices, where available. Subscribers to P&P's monthly newsletter, Project Report, receive a free copy of the report with their January issue. All others may obtain a copy of the report for US$105. To order, send payment to Pulp & Paper, Editorial Dept., 500 Howard St., San Francisco, Calif. 94105.

UNITED STATES

SPENDING FALLS OFF DUE TO ECONOMIC UNCERTAINTY, COMPLETION OF PROGRAMS

■ U.S. pulp and paper companies responding to *P&P*'s latest survey report plans to spend $6.71 billion on capital modernization and expansion projects for the 1986-88 period. That figure is down a sharp 18.8% from the total reported last year, reflecting the completion of several major programs in 1985 and the absence of major new projects to take their place in 1987 and later years. For example, 15 of the 44 largest expansion/modernization projects listed last year were completed in 1985, and only seven new projects of similar size were announced in 1986. In general, papermakers have been more cautious about committing to large new expansion or modernization projects, reflecting concern about the economy and the effects of tax reform.

Production-related spending shows a drop of 18.1% to $6.36 billion for the 1986-88 period, while papermakers report plans to spend $347.9 million on environmental projects, down 5.7% from last year. Production spending accounts for 95% of total reported outlays, compared with 96% in last year's survey. Environmental spending dropped over 22% in last year's survey and has fallen every year since 1982. For 1986-88, outlays for pollution

TOP SPENDERS IN U.S.

Companies which have reported capital spending plans of $100,000,000 or more, including both production and environmental programs

	1986-88	1985-87
Fort Howard Paper[1]	$900,000,000	$600,000,000
Pentair Industries[1]	637,500,000	725,000,000
International Paper[2]	585,895,000	1,295,770,000
Bowater	473,350,000	500,850,000
Champion International	389,100,000	1,047,007,000
Scott Paper	331,000,000	617,000,000
Consolidated Papers	271,900,000	311,200,000
Georgia-Pacific	270,000,000	380,000,000
Federal Paper Board	266,000,000	91,250,000
James River[1]	240,000,000	177,500,000
Great Northern Nekoosa[1]	232,880,000	231,628,000
Manistique Papers	183,000,000	183,000,000
Westvaco	180,000,000	180,000,000
Potlatch	178,000,000	142,041,000
Stone Container	150,141,000	117,750,000
Union Camp	131,000,000	165,000,000
Mead	107,000,000	139,000,000
Jefferson Smurfit	102,750,000	102,550,000

1. Includes programs for completion beyond three-year period indicated.
2. Includes Hammermill Paper Co. spending of $342.2 million in 1986-88 and $408.8 million in 1985-87.

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN U.S.

(over $50,000,000 at an existing mill site)

	1986-88
Bowater Carolina, Catawba, S.C.	$363,000,000[1]
Bowater/Catawba, Catawba, S.C.	64,350,000
Champion International, Canton, N.C.	72,000,000
Champion International, Lufkin, Texas	82,300,000
Champion International, Pensacola, Fla.	200,000,000
Chesapeake, West Point, Va.	56,000,000
Consolidated/Biron, Wisconsin Rapids, Wis.	215,000,000[1]
Erving Paper Mills, Erving, Mass.	55,000,000[2]
Federal Paper Board, Augusta, Ga.	150,000,000
Federal Paper Board, Sprague, Conn.	100,000,000
Georgia-Pacific, Zachary, La.	200,000,000[1]
GN Nekoosa, East Millinocket, Maine	156,100,000
Hammermill Paper, Selma, Ala.	253,000,000[1]
International Paper, Selma, Ala.	250,000,000[1]
James River, Pennington, Ala.	120,000,000[1]
Longview Fibre, Longview, Wash.	99,000,000
Manistique Papers, Manistique, Mich.	183,000,000
Mead, Escanaba, Mich.	51,000,000
Packaging Corp. of America, Counce, Tenn.	60,000,000
Pentair/NOW, Niagara, Wis.	101,000,000[2]
Pentair/Port Huron, Port Huron, Mich.	88,000,000[2]
Potlatch, Cloquet, Minn.	n.a.[1]
Potlatch, Lewiston, Idaho	103,000,000
Scott Paper, Chester, Pa.	115,000,000
Scott Paper, , Skowhegan, Maine	216,000,000[1]
Jefferson Smurfit, Jacksonville, Fla.	54,100,000
Southwest Forest, Panama City, Fla.	65,000,000
Stone Container, Florence, S.C.	104,010,000
Union Camp, Franklin, Va.	131,000,000
Westvaco, Covington, Va.	180,000,000[1]
Willamette, Hawesville, Ky.	n.a.
Willamette, Campti, La.	n.a.
Willamette, Albany, Ore.	n.a.

1. Includes new paper machine.
2. Includes programs for completion in 1989 and later.

U.S. GREENFIELD MILL PROJECTS

UNDER CONSTRUCTION OR STARTED UP IN 1986	Startup
Pentair/Great Lakes, Duluth, Minn. 235,000-tpy clay-filled supercalendered groundwood*	1988
Fort Howard Paper, Rincon, Ga. 1,500-tpd recycled tissue mill with four machines*	1992

UNDER ACTIVE CONSIDERATION (NO STARTUP DATE)

Augusta Kraft, Augusta, Ga.
Proposed 262,500-tpy kraft linerboard mill; on hold

Unspecified, Richmond, Calif.
175,000-tpy recycled newsprint mill under study; decision expected soon

Great Lakes Forest Products, Usk, Wash.
154,000-metric tpy TMP/newsprint mill*; postponed until market conditions improve

Kenaf International, southern Texas
Proposed kenaf newsprint mill under study

Mississippi Chemical Corp., Northeast Mississippi
Newsprint mill under study

*Paper machine also included in New Machine table.

have spent heavily to improve product quality, cut costs, and raise capacity. Last year, this category accounted for 17% of overall spending, up from 13% in 1985, 11% in 1984, and only 6% in 1983.

NEW MILLS AND MACHINES. At 26.8% of the total, new paper machines will consume the largest percentage of capital funds for the 1986-88 period, up from 22.5% in last year's survey. Spending for new paper machine installations dropped a relatively slight 2.9% in the current survey to $1.81 billion. However, most of the new machines included in the survey were started up in 1986, and spending in this category should drop significantly after this year. Nine major new paper machines came online in 1986, the most additions since the boom years of 1980 and 1981. In contrast, only four such machines were started up in 1985, and only two are scheduled for completion in 1987.

Seven of the new paper machines started up last year were in the printing and writing grades, with two each in lightweight coated groundwood and uncoated free-sheet, one in coated free-sheet, and one in cotton fiber (see table for details). Also completed were a new bleached paperboard machine and a new tissue unit. Spending for all nine installations is estimated at $1.19 billion.

Less spending for capacity growth? The dropoff in new paper machine projects after 1986 is reflected in the latest forecast for capacity additions. U.S. paper and paperboard capacity will grow only 1.8% annually from 1987 to 1989, whereas growth has averaged about 2.1% over the past ten years, according to the API. About 42% of the new capacity is expected online this year, most of it in the printing and writing area.

Only two new paper machines are currently scheduled for completion in 1987, both tissue units. Georgia-Pacific will install a new 210-in.-trim Beloit tissue unit at its Palatka, Fla., mill, and Fort Howard Paper Co. will start up the first of four tissue machines this year at its greenfield recycled tissue mill in Rincon, Ga. No. 16 machine will have capacity for about 250 tpd. Fort Howard plans to install three more machines at the $900-million facility by 1992, bringing capacity up to about 1,500 tpd.

In 1988, Lake Superior Pulp & Paper Inc. will bring online its new supercalendered groundwood paper mill at Duluth, Minn., and Potlatch Corp. will complete installation of a new coated free-sheet unit at its Cloquet, Minn., facility. Voith is supplying both machines.

Other projects waiting in the wings. Depending on market conditions, a number of proposals for new paper machines and paper mills are poised to move forward quickly—particularly in the newsprint field. Great Lakes Forest Products Ltd. is waiting for conditions to improve before proceeding with a new newsprint mill in Usk, Wash., and a decision by an unnamed paper company on a new recycled newsprint mill in Richmond, Calif., is expected soon. Possible newsprint installations have spent heavily to improve product quality, cut costs, and raise capacity. Last year, this category accounted for 17% of overall spending, up from 13% in 1985, 11% in 1984, and only 6% in 1983.

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NEW PAPER MACHINES IN U.S.

UNDER CONSTRUCTION OR STARTED UP IN 1986	**Startup**
Bowater Carolina, Catawba, S.C. 197,000-tpy, 336-in. No. 2 Beloit—LWC	**1986**
Consolidated/Biron, Wisconsin Rapids, Wis. 180,000-tpy, 288-in.-trim Voith—LWC	**1986**
Georgia-Pacific, Zachary, La. 230,000-tpy, 378-in. Valmet—uncoated free-sheet	**1986**
Hammermill Paper, Selma, Ala. 185,000-tpy, 350-in.-trim Voith—uncoated free-sheet	**1986**
International Paper, Pine Bluff, Ark. 200,000-tpy coated groundwood	**1986**
James River, Pennington, Ala. 70,000-tpy, 260-in. Beloit—tissue	**1986**
Kimberly-Clark, Whiting, Wis. 90-tpd Sulzer Escher Wyss—cotton fiber	**1986**
Scott/S.D. Warren, Skowhegan, Maine 290-in.-trim, 215,000-tpy Beloit—coated free-sheet	**1986**
Westvaco, Covington, Va. 278-in.-trim, 175,000-tpy Voith—bleached paperboard	**1986**
Fort Howard Paper, Rincon, Ga. 250-tpd tissue machine	**1987**
Georgia-Pacific, Palatka, Fla. 210-in.-trim No. 5 Beloit—tissue	**1987**
Linweave Fine Papers, Holyoke, Mass. 25,000-tpy fine paper	**1987**
Pentair/Great Lakes, Duluth, Minn. 235,000-tpy, 285-in.-trim Voith—SC groundwood	**1988**
ANNOUNCED, WITH STARTUP DATE	
Potlatch, Cloquet, Minn. 194-in.-trim Voith—coated free-sheet	**1988**
Fort Howard Paper, Rincon, Ga. Three tissue machines (1988, 1990, 1992)	**1988-92**
PROPOSED (NO STARTUP DATE)	
Great Northern Nekoosa, Ashdown, Ark. 210,000-tpy No. 64 uncoated free-sheet machine under study	
Bear Island Paper, Ashland, Va. Alternate site for proposed Soucy Inc. newsprint machine	
Blandin Paper, Grand Rapids, Minn. 204,000-tpy, 280-in.-trim LWC; postponed from 1988 target	
Champion International, Quinnesec, Mich. Coated free-sheet machine under study	
Chesapeake, Menasha, Wis. No. 4 tissue machine was under study; no recent activity	
Federal Paper Board, Augusta, Ga. Final stage of expansion to include new machine—bleached board	
International Paper, undetermined 150,000-tpy coated free-sheet machine	
James River, unspecified Studying new tissue machine installation	
Midtec Paper, Kimberly, Wis. Studying one machine to replace four—coated free-sheet	
Owens-Illinois, Tomahawk, Wir. Replacement corrugating medium machine under study	
Southeast Paper Manufacturing, Dubling, Ga. Proposed 450-tpd recycled newsprint machine	
Tagsons Papers, Mechanicville, N.Y. Tissue expansion proposal may include new machine	
Union Camp, Eastover, S.C. Considering second free-sheet machine	
Westvaco, unspecified New paper machine reportedly under study	

are also under study in Mississippi and Texas.

Another area of potential major activity is coated free-sheet. New paper machines are under consideration for Champion International's Quinnesec, Mich., mill and Midtec Paper Corp.'s Kimberly, Wis., facility. Westvaco Corp. has announced plans to boost its coated free-sheet capacity as well, although details have not been released.

CANADA

IMPROVED SALES AND EARNINGS WILL HELP FUEL NEEDED CAPITAL IMPROVEMENTS

■ The capital spending picture continues to brighten in the Canadian pulp and paper industry, *P&P*'s survey shows. Total outlays of C$4.40 billion are reported for the 1986-88 period, an increase of 7.3% over last year's survey. Although many companies will continue to be hampered by high debt, capital spending should benefit from the rebound in profits in 1986 and prospects for good business conditions in 1987. Canadian companies have benefited from higher prices for pulp and most paper grades, better newsprint operating rates, and the relative weakness of the Canadian dollar.

Production-related spending totals $4.20 billion for the current three-year period, survey results show, a gain of 8.5% over last year's total. Environmental spending, however, drops 12.1% in the new survey to $205 million. Spending for air pollution abatement rose 23.7% in this year's survey, but the gain was more than offset by declines of 16.0% in water pollution controls and 60.5% for solid waste handling.

TOP SPENDERS IN CANADA

Companies which report capital spending plans of C$100,000,000 or more, including both production and environmental programs

	1986-88	1985-87
Domtar*	C$931,208,000	C$904,451,000
Repap Enterprises	330,000,000	280,000,000
Kruger*	258,600,000	328,600,000
Consolidated-Bathurst	238,900,000	253,300,000
Abitibi-Price	213,700,000	249,700,000
Ontario Paper	208,600,000	237,800,000
E.B. Eddy Forest Products*	205,526,000	130,383,000
Weyerhaeuser Canada*	202,500,000	n.a.
Western Pulp	185,000,000	145,900,000
Miller Western Pulp	185,000,000	—
Fibreco Export	170,000,000	—
Donohue	170,000,000	256,181,000
CIP	128,200,000	149,300,000
Tembec	103,000,000	118,500,000

*Includes programs for completion beyond three-year period indicated.

Spending by category. Fueled by the announcement of a number of new mechanical pulp installations, spending in the pulping area climbed 23.9% in this year's survey. Pulping improvements account for about 36.6% of overall spending, up from 32% last year. The emphasis on fiber supply also helped boost woodyard outlays to $153 million, up 38.3% from last year.

After falling 17% last year, reported spending for new paper machines is up 57.7% in this year's survey to $1.06 billion. Outlays for paper machine rebuilds, however, fell 17.5% this year after a 21% decline in last year's survey. Reported spending for machine rebuilds totals $756 million for the 1986-88 period, 17.1% of overall outlays. New paper machines account for 24.0% of total spending in this year's survey.

Planned spending for energy projects has been particularly erratic in recent surveys, rising one year only to plummet the next, and this year it will continue that pattern. Outlays for energy projects are reported at $269 million for the 1986-88 period, down 25.8% from last year's survey.

Capacity expansion picks up. Capital spending will get more of a boost from capacity growth in Canada than in the U.S., according to the Canadian Pulp & Paper Assn.'s most recent survey. Paper and paperboard capacity growth will average 2.34% a year through 1988, the CPPA reported, compared with a 1.31% annual rate between 1975 and 1985. The highest growth will come in the printing and writing grades, and the prospects are mixed for Canada's two most important commodities, newsprint and market kraft pulp. Newsprint growth will average 1.27% a year, slightly higher than the ten-year average of 0.9% a year. Bleached kraft market pulp capacity, on the other hand, will only grow at a 0.7% a year rate, well below its ten-year average of 1.78% a year.

Newsprint. The newsprint sector should contribute more to capital spending than its modest growth prospects suggest because retirement or conversion of old capacity is keeping growth down more than the lack of new capacity additions. Two new newsprint machines are included in the current survey period: CIP Inc.'s 155,000-metric-tpy machine at Gatineau, Que., and Donohue Inc.'s 180,000-tpy unit at Clermont, Que.

A number of mills are proceeding with programs to upgrade existing newsprint machines with twin-wire formers and to modernize pulping facilities. Consolidated-Bathurst Inc. is spending about $135 million to upgrade paper machines and add new TMP capacity at its Shawinigan and Ville de la Baie, Que., mills. Kruger Inc. has major improvement programs worth about $260 million under way at its Bromptonville, Que., and Corner Brook, Nfld., mills. Ontario Paper Inc. is spending about $200 million to modernize its Baie Comeau, Que., and

Thorold, Ont., mills. Crown Forest Industries Ltd. recently approved improvements worth about $65 million at its Elk Falls, B.C., mill, and Domtar Inc. will install a new $80-million CTMP mill at its Dolbeau, Que., mill.

In addition to these scheduled projects, a number of companies are prepared to move ahead with newsprint expansions if market conditions continue to improve. In eastern Canada, Bato Inc. announced recently that it was considering a new 200,000-tpy, $230-million newsprint machine for its F.F. Soucy Inc. mill at Rivière-du-Loup, Que. Bato says that the new machine is contingent on financial aid from the government, however—which could kill the project, since the federal government's policy is to refuse grants for capacity-expanding projects. Newspaper publisher Quebecor Inc. has proposed a new 180,000-tpy newsprint mill for the Matane region of Quebec, but the government appears to favor another project for the site.

Also in eastern Canada, Abitibi-Price Inc. has long-range plans for another newsprint machine at its Iroquois Falls, Que., mill. And in the western area, Finlay Forest Industries Ltd. has begun a feasibility study for a new newsprint machine at its 450-tpd bleached refiner-mechanical pulp mill at Mackenzie, B.C.

Fastest growth in printing/writing. Quebecor's Matane mill venture appears to have lost out to a proposal by Norwegian forest products company Saugbrugs for a $377-million, 180,000-tpy supercalendered groundwood paper mill in the region. The joint Saugbrugs/Rexfor mill has reportedly been held up by problems getting financing assistance from Ottawa, however.

Canada's hottest segment for capacity growth is printing and writing papers. Groundwood printing and spe-

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN CANADA

(over C$50,000,000 at an existing mill site) 1986-88

Abitibi-Price, Jonquiere, Que.	C$110,000,000
Cascades, Port Cartier, Que.	85,000,000
CIP, Gatineau, Que.	70,700,000[1]
Consolidated-Bathurst, Shawinigan, Que.	84,000,000
Con-Bathurst, Ville de la Baie, Que.	50,700,000
Crown Forest Industries, Elk Falls, B.C.	65,000,000
Domtar, Dolbeau, Que.	82,925,000
Domtar, Windsor, Que.	754,000,000[1,2]
Donohue, Clermont, Que.	170,000,000[1]
E.B. Eddy Forest Products, Espanola, Ont.	167,617,000[2]
James River-Marathon, Marathon, Ont.	56,835,000[2]
Kruger, Bromptonville, Que.	58,600,000
Kruger, Corner Brook, Nfld.	200,000,000[2]
Ontario Paper, Baie Comeau, Que.	136,000,000
Ontario Paper, Thorold, Ont.	72,600,000
Repap, Newcastle, N.B.	280,000,000[1]
Tembec, Temiscaming, Que.	103,000,000
Western Pulp, Squamish, B.C.	176,000,000
Weyerhaeuser Canada, Prince Albert, Sask.	202,500,000[1,2]

1. Includes new paper machine.
2. Includes programs for completion in 1989 and later.

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1986-88+ BY REGION AND TYPE OF FACILITY (C$000)

	PRODUCTION-RELATED EXPENDITURES											
	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
Maritimes	$ 29,915	20%	$ 126,411	8%	$220,000	21%	$116,070	15%	$48,485	18%	$33,296	7%
Quebec	15,600	10%	832,885	52%	614,000	58%	314,641	42%	73,550	27%	122,916	27%
Ontario	46,400	30%	178,886	11%	28,000	3%	279,629	37%	35,855	13%	143,941	32%
Central	60,390	40%	468,905	29%	—	0%	43,121	6%	111,000	41%	46,311	10%
West	600	0%	5,400	0%	197,500	19%	2,400	0%	—	0%	—	0%
Total	**$152,905**		**$1,612,487**		**$1,059,500**		**$755,861**		**$268,890**		**$457,103**	

	ENVIRONMENTAL QUALITY SPENDING						TOTALS					
	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENTAL		GRAND TOTAL	
Maritimes	$ 8,230	9%	$ 17,550	17%	$ 1,690	12%	$ 574,179	14%	$ 25,220	12%	$ 599,399	14%
Quebec	37,420	39%	36,800	37%	8,513	58%	2,973,592	47%	78,183	38%	2,051,775	47%
Ontario	6,754	7%	634	1%	1,553	11%	712,711	17%	8,941	4%	721,652	16%
Central	43,650	45%	45,715	45%	2,830	19%	729,727	17%	92,195	45%	821,922	19%
West	—	0%	—	0%	—	0%	205,900	5%	—	0%	205,900	5%
Total	**$96,054**		**$ 100,699**		**$ 14,586**		**$4,196,109**		**$204,539**		**$4,400,648**	

1. Includes C$1,345,314,000 for projects for startup in 1989 and after ($1,295,714,000 production; $49,600,000 environmental).
Provinces are assigned to regions as follows: Maritimes: New Brunswick, Newfoundland, Nova Scotia; Central: Manitoba, Saskatchewan; West: British Columbia, Alberta.

cialty papers will jump 28% by 1988, mostly on the strength of conversions from newsprint to other grades. The largest of these still pending is Abitibi-Price Inc.'s $110-million supercalendered groundwood project at Jonquiere, Que. The Saugbrugs proposal, along with a new machine under study by Consolidated-Bathurst Inc. for its Grand Mere, Que., mill, were not included.

Book and writing paper capacity will grow 33% by 1988. Repap Enterprises Inc. completed its 200,000-tpy lightweight coated groundwood mill at Newcastle, N.B., this year for $280 million. Domtar Inc. is proceeding with its $754-million modernization at Windsor, Que., which includes a 175,000-tpy uncoated free-sheet machine for startup in 1987 and a similar unit for 1989.

Looking beyond 1988, Weyerhaeuser Canada Ltd. will install a new 182,000-tpy uncoated free-sheet machine at its newly purchased Prince Albert, Sask., mill for startup in 1989. No progress has been observed recently with Makin Pulp & Paper Ltd.'s proposed 135,000-tpy groundwood paper mill at Britannia Beach, B.C.

Pulp expansions. Pulp capacity will climb at an annual rate of 1.4% through 1988, according to the CPPA—well above the 0.6% annual rate for the past ten years. Tembec Inc. completed a $103-million market chemithermomechanical pulp mill in 1986, and two new market bleached CTMP mills were announced in 1986 for startup in 1988. Millar Western Pulp Ltd. will build a $185-million, 177,500-tpy facility at Whitecourt, Alta., and Fibreco Export Inc. will build a $170-million, 180,000-tpy mill in interior British Columbia.

Only one new major chemical pulping project was announced in Canada this year: Repap's plan to boost capacity about 100,000 tpy in a $50-million modernization at its recently purchased Skeena mill in Prince Rupert, B.C. Another expansion plan is under study at Champion International Corp.'s Hinton, Alta., mill. If approved, the $300-million project would serve to double bleached kraft market pulp capacity to about 412,000 tpy. ■

REPORTED CANADIAN EXPENDITURES BY PROVINCE, 1986-88[1]

PROVINCE	PRODUCTION	ENVIRONMENTAL	TOTAL
Alberta	C$ 160,000	C$29,900	C$ 189,900
British Columbia	569,727	62,295	632,022
Manitoba	3,400	—	3,400
New Brunswick	303,500	5,000	308,500
Newfoundland	205,700	15,000	220,700
Nova Scotia	64,979	5,220	70,199
Ontario	712,711	8,941	721,652
Quebec	1,973,592	78,183	2,051,775
Saskatchewan	202,500	—	202,500
Unspecified	—	6,800	6,800
Total	**C$4,196,109**	**C$204,539**	**C$4,400,648**

1. Includes projects, as announced, to be completed in 1987 and later.

NEW PAPER MACHINES IN CANADA
(metric tons)

UNDER CONSTRUCTION OR STARTED UP IN 1986	Startup
Domtar, Trenton, Ont. 99,000-tpy, 195-in. Black Clawson-corrugating medium	1986
CIP, Gatineau, Que. 155,000-tpy, 256-in.-trim Voith—newsprint	1986
Repap Enterprises, Newcastle, N.B. 200,000-tpy, 297-in.-trim Valmet-Dominion—LWC	1986
Donohue, Clermont, Que. 180,000-tpy, 330-in.-trim Valmet-Dominion—newsprint	1987
Domtar, Windsor, Que. 175,000-tpy, 330-in. Beloit—uncoated free-sheet	1987

ANNOUNCED WITH STARTUP DATE	
Domtar, Windsor, Que. Second 175,000-tpy machine—uncoated free-sheet	1989
Weyerhaeuser Canada, Prince Albert, Sask. 182,000-tpy, 315-in.—uncoated free-sheet	1989

PROPOSED (NO STARTUP DATE)

Abitibi-Price, Iroquois Falls, Ont.
Proposed newsprint machine; timing not decided
Consolidated-Bathurst, Bathurst, N.B.
180,000-tpy machine under study—SC groundwood
Finlay Forest Industries, Mackenzie, B.C.
Studying feasibility of adding newsprint machine
Soucy Inc. et Assoc., Riviere du Loup, Que.
200,000-tpy machine under consideration—newsprint
St. Mary's Paper Inc., Sault Ste. Marie, Ont.
Proposed 156,000-tpy No. 5 SC groundwood; postponed

GREENFIELD MILLS—CANADA
(metric tons)

UNDER CONSTRUCTION OR STARTED UP IN 1986	Startup
Repap Enterprises, Newcastle, N.B. 200,000-tpy LWC mill; pulp supplied from nearby Nelson-Miramichi and Newcastle pulp mills*	1986
Tembec, Temiscaming, Que. 100,000-tpy, single-line market bleached CTMP mill	1986

ANNOUNCED WITH STARTUP DATE	
Fibreco Export, Interior B.C. 180,000-tpy, two-line market bleached CTMP mill	1988
Millar Western Pulp, Whitecourt, Alta. 177,500-tpy, two-line market bleached CTMP mill	1988

PROPOSED (NO STARTUP DATE)

Dong Bang Chemical Co., Ocean Falls, B.C.
Studying 82,500-tpy neutral sulfite anthraquinone market pulp mill for old newsprint mill site
Makin Pulp & Paper, Britannia Beach, B.C.
135,000-tpy, two-machine groundwood paper mill; project currently seeking financing
Quebecor, Matane, Que.
Proposed 180,000-tpy newsprint mill
Saugbrugsforeningen, Matane, Que.
Proposed 200,000-tpy supercalendered groundwood mill

*Paper machine included in New Machine table.

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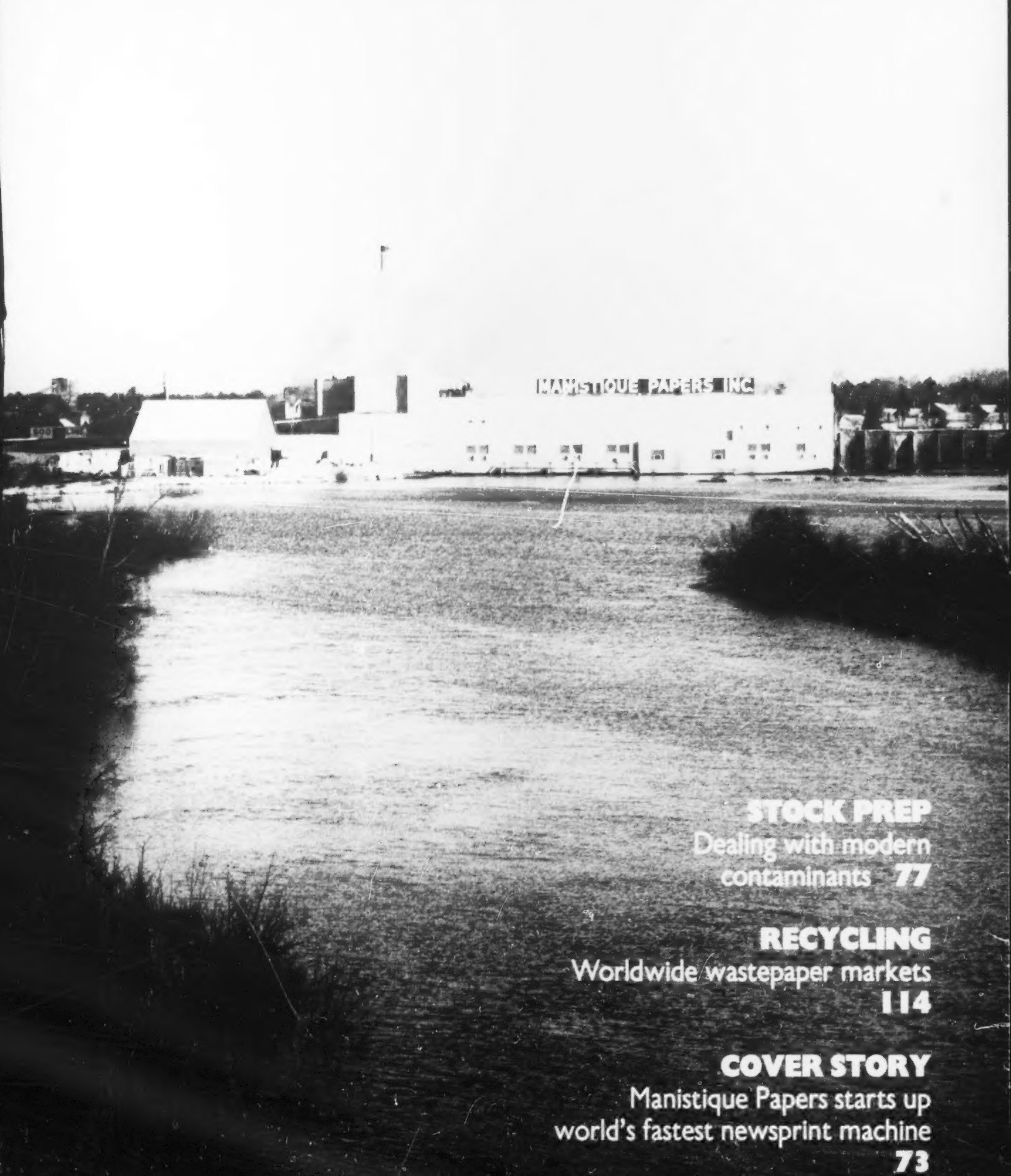

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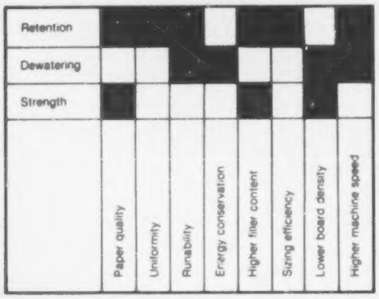

	Paper quality	Uniformity	Runability	Energy conservation	Higher filler content	Sizing efficiency	Lower board density	Higher machine speed
Retention	■	■	■	□	■	■	□	■
Dewatering	□	□	■	■	□	□	■	■
Strength	■	□	□	□	■	□	■	□

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With its newly rebuilt machine, Manistique Papers has the potential to become the world's fastest newsprint producer. See story beginning on p. 73. **(Staff photo by Kenneth E. Smith.)**

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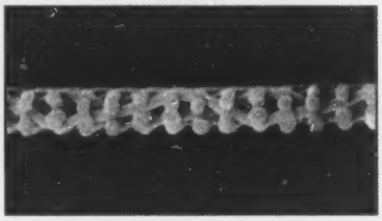

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PULP & PAPER

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PULP & PAPER (ISSN 0033-4081) is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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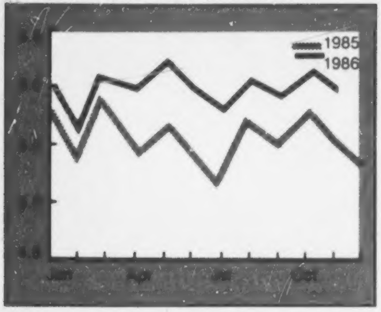
U.S. paper and board production



U.S. production of paper and paperboard totaled 5.9 million tons in November, up 6.5% from the same month in 1985, according to the American Paper Institute. The two-month trend rate reached 71.7 million tpy, and total production for the year now appears likely to reach a record 70.6 million tons—5.3% greater than last year and 3.1% above the previous record, set in 1984. Looking further ahead, current low inventory levels are an indicator of future production strength, the API said. Recent new declines in the dollar are also likely to keep production strong.

Among major grades, higher production for export sparked year-to-year increases of 6.9% for unbleached kraft board and 8.4% for solid bleached board. Printing and writing papers continued to lead the gains in the paper sector, with uncoated free-sheet shipments about 8.4% higher than last year. Tissue and newsprint both continued up about 3.0% from 1985, while packaging continued to lag last year's rate.

Canadian newsprint shipments in November rose 3.4% compared with the previous year, and operating rates jumped to 97%. Woodpulp shipments were up 9.5% over 1985, with operating rates steady at 91%. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION					
Newsprint	Nov.	473	8.0	5,628	3.4
Uncoated groundwood (s)	Nov.	127	−7.3	1,520	−0.7
Coated paper (s)	Nov.	548	16.1	6,254	5.7
Uncoated free sheet (s)	Nov.	902	10.4	10,563	8.4
Other printing/writing	Nov.	112	−1.8	1,394	3.8
Total packaging and other paper (s)	Nov.	417	−1.0	5,141	−1.8
Tissue	Nov.	420	0.2	5,094	3.0
Total paper	**Nov.**	**2,998**	**6.4**	**35,592**	**4.2**
Unbleached kraft paperboard	Nov.	1,457	7.6	17,633	6.9
Semichemical medium	Nov.	454	6.3	5,383	5.4
Bleached paperboard	Nov.	348	6.4	4,284	8.4
Recycled paperboard	Nov.	688	4.4	8,200	7.0
Total paperboard	**Nov.**	**2,948**	**6.5**	**35,500**	**7.0**
Total U.S. paper and paperboard output	**Nov.**	**5,946**	**6.5**	**71,092**	**5.6**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Oct.	4,881	6.2	57,255	5.7
Market pulp production	Oct.	593	4.2	7,478	10.1
Wastepaper consumption at paper/board mills	Oct.	1,419	4.0	16,610	8.4
Pulpwood consumption (cords)	Oct.	7,779	1.5	91,150	5.9
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Nov.	21.046	3.3	260.536[6]	5.5
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,175	−12.7		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Oct.	998	1.1	11,557	3.5
Imports of Canadian newsprint	Oct.	686	−0.9	8,304[6]	2.0
U.S. paper exports (including products)	Oct.	366	9.6	4,675	16.2
Exports of unbleached kraft linerboard	Oct.	162	11.0	2,166	19.1
Exports of woodpulp	Oct.	344	27.9	4,484	19.2
Norscan pulp inventories[4]	Nov. 30	1,035	−33.4		
Norscan pulp operating rates[4]	Nov.	97%	96%	90%	97%
CANADIAN STATISTICS[5] (reported in metric tons)					
Total newsprint shipments	Nov.	743	−2.2	8,487[6]	3.4
Operating rates	Nov.	97%	93%	94%	92%
Inventories held by U.S. consumers	Nov. 30	1,263	−12.8		
Other paper/board shipments	Nov.	491	2.1	5,537	9.4
Woodpulp shipments (export only)	Nov.	541	−10.3	6,984[6]	9.5
Operating rates	Nov.	91%	92%	92%	88%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

TISSUE: Consumer prices poised for an increase

Grade structure: Tissue falls into two major groups: sanitary and "other." About 98% of total ouput is sanitary, including bathroom, facial, toweling, napkins, basestock for sanitary stock, wadding, and wipes. The "other" group includes basestock for waxing, wrapping, and miscellaneous.

The two major markets for tissue are consumer and commercial and industrial (C&I). Consumer tissue is purchased by people at retail outlets, while industrial tissue is bought by hotels, offices, restaurants, and factories. Typical basis weights for tissue include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

Tissue demand in the U.S. is expected to decrease as population growth slows down. However, industry sources predict per capita tissue consumption will increase from 38.5 to 45.2 lb in the next decade.

The tissue industry has restructured as a result of James River Corp.'s purchase of Crown Zellerbach Corp. In the C&I tissue sector, Fort Howard Paper Co. ranks first with 31% of the 1.6-million-tpy market, followed by James River with 26%, and Scott Paper Co. with 9%.

Production/capacity: Tissue capacity in the U.S. has been steadily increasing since 1971 and in 1986 reached about 5.508 million tons. Little new consumer tissue capacity is expected to come onstream in 1987. Most of thenew capacity will be in the C&I segment of the tissue market, and C&I producers have already covered themselves by implementing a 5% price increase last fall.

In April, Fort Howard Paper Co. will start up the first of four recycled tissue machines at its $1-billion Savannah River mill in Rincon, Ga. No. 16 will have capacity for 250 tpd, most of which will end up in the C&I segment. In the fall, Georgia-Pacific Corp. plans to retire an old machine and start up a new one at its Palatka, Fla., mill, increasing capacity by about 100 tpd. This new production will be split between consumer and C&I areas. American Tissue Co. plans to convert Diamond International Corp.'s idle molded pulp mill into a recycled tissue mill late this year.

Outlook: There is some fear that by next year overcapacity may plague the industry. Late last year, James River announced it was going to bring on four tissue machines in the next eight years. Not all of that capacity will be new since some of the older machines will probably be retired. The first machine will be built at the Wauna Div. mill in Clatskanie, Ore., formerly owned by Crown Zellerbach. The 70,000-tpy machine is slated to start up in 1988 and will probably cost about $88 million, including converting lines.

Analysts estimate that Fort Howard is adding about 665,000 tons of capacity during the 1983-93 period, or about two thirds of the total tissue market's anticipated growth.

The operating rate has been flat: 92.4% in 1985 and, based on the first nine months, about 92.2% in 1986. Plus, U.S. tissue capacity is expected to grow 3.0% this year, 2.6% in 1987, 2.5% in 1988, and 2.0% in 1989, according to the American Paper Institute's recent capacity survey.

This works out to an average annual growth rate of 2.4% for 1987-89, representing an additional 402,000 short tons of capacity. However, these figures reportedly do not include the four machines James River is planning.

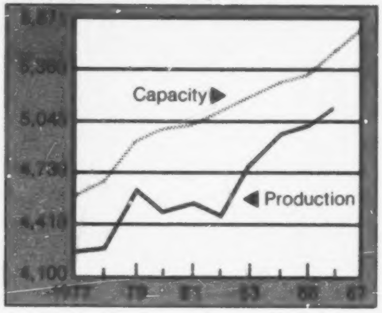
The API has understated capacity in recent surveys and has revised capacity growth upward by 1.1% in 1986, 1.9% in 1987, and 3.1% in 1988.

With pulp and wastepaper prices still on the rise, consumer tissue producers should be successful in pushing through a price increase this year, particularly since most of the new capacity coming onstream in 1987 is in the C&I sector. As for C&I producers, the 5% price hike they instituted in the third quarter of 1986 has been well accepted.

Prices: Price trends tracked by the Bureau of Labor Statistics' producer price index for sanitary papers and health products are as follows (year-end, 1967 = 100): 1974, 181.1; 1975, 201.7; 1976, 223.5; 1977, 240.7; 1978, 264.3; 1979, 291.0; 1980, 338.8; 1981, 348.4; 1982, 361.0; 1983, 359.7; 1984, 371.4; 1985, 380.6; 1986 (third quarter), 383.6.

SUPPLY/DEMAND *(000 tons)*

U.S. paper and board production



FORECAST *(000 tons)*

	1985	1986e	1987e
Production	4,941	5,078	5,198
Capacity[1]	5,345	5,508	5,651
Utilization rate	91.8%	92.2%	92.0%
Imports[2]	56	65	75
Exports[2]	18	16	13
Apparent U.S. consumption	4,979	5,127	5,260
lb/capita	42.0	43.2	44.3
GNP ratio[3]	2.77	2.79	2.79

e = Estimate.

1. American Paper Institute data.
2. U.S. Dept. of Commerce data.
3. 000 tons/$ billion real GNP (1982)

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Scott Paper	1,035	18.3
2. James River	1,010	17.9
3. Procter & Gamble	900	15.9
4. Fort Howard	850	15.0
5. Georgia-Pacific	540	9.6
6. Kimberly-Clark	433	7.7
7. Erving-Paper Mills	150	2.7
8. Pope & Talbot	148[1]	2.6
9. Chesapeake	110	1.9
10. APL	95	1.7

Market share of top five companies:
76.7%

Market share of top ten companies:
93.3%

Total U.S. capacity (1986):
5.651 million short tons

[1] Includes purchase of Potlatch Corp.'s 49,200-tpy tissue and towel mill in Ransom, Pa.

of sodium sulfite, possibly 1% to 5%, and caustic, perhaps about 1%. It also may involve a reduced proportion of chemical fibers to mechanical fibers.

Possibilities along those lines were suggested by Thomas McDonough, group leader of pulping and bleaching at the Institute of Paper Chemistry. McDonough said that one way to improve smoothness and pick resistance is through improved bonding of pulp fibers after grinding through oxidated treatments such as chlorine dioxide, followed by strongly alkaline hydrogen peroxide. Strongly alkaline treatments in general will improve fiber bonding, McDonough said.

Another possible process would involve recycling of spent bleaching liquor from the peroxide bleaching stage back to the grinders to be used or mixed with grinder shower water so that the grinding is done in an alkaline environment, he suggested.

The latter technology has been developed by the Swedish firm MoDo-Chemetics. It is similar to alkaline post-treatment of finished pulp, with the added feature of softening the lignin at the time of fiber separation to mitigate much of the fiber damage that usually occurs during mechanical pulping. "If you treat the pulp with alkali after it's made, then softening of the lignin has the beneficial effect of making the fibers more flexible and more conformable to one another," McDonough explained. Adding sodium sulfite softens lignin in a similar manner.

Several southern mills that use coarse pine fiber to make lighter-weight coated publication papers are considering such processes. Weyerhaeuser Co. reportedly has been doing experiments at Columbus, Miss., since 1982.

Rebalancing mill system. With the startup of the new Pine Bluff machine specializing in medium-weight paper, IP is adjusting the grade mix on five other coated publication paper machines at two northern mills. At the Androscoggin mill in Jay, Maine, IP will focus Nos. 2 and 3 machines on lightweight coated papers (32 and 34 lb). Some medium weights, however, will still be made for some customers in the Northeast, where freight rates and delivery times are favorable. And the Hudson River mill in Corinth, N.Y., will specialize more in the heavier weight (50 to 80 lb) and higher brightness papers (78 to 80 GE) sold for nonmagazine uses. ■

FORECAST

FAO sees better scenario for world capacity

Worldwide capacity for paper-grade woodpulp is expected to grow by 2.0% annually from 1985 to 1990, reaching 167.7 million metric tons. Total paper and board capacity is expected to grow 1.9% during the period to 241.7 million tons, according to the latest survey by the United Nations' Food & Agriculture Organization. Estimated pulp capacity for 1990 will be almost double the amount forecast in the FAO's previous *Pulp and Paper Capacities* survey.

In 1985, capacity for paper-grade woodpulp was estimated at 151.2 million tons, an average annual rise of 1.7% from 1980 levels. Capacity is expected to increase by 16.5 million tons by 1990 to 167.7 million tons—a 2.0% annual increase. Capacity for paper and board in 1985 was 220.4 million tons, a rise of 7.9 million tons from 1984. By 1990 this is expected to increase by 21.3 million tons to 241.7 million tons, a rise of about 1.9% compared with a 2.2% increase during 1980-85.

The fastest growth in paper and

FAO forecasts for world paper and pulp capacity.

World woodpulp capacity, 1985-90

	Capacity (000 metric tons)		Annual average increase	
	1985	1990	1980-85	1985-90
World total	151,157	167,705	1.7%	2.0%
Developed economies	123,220	130,408	1.4	1.1
North America	75,255	78,319	1.9	0.8
Japan	12,014	12,451	−0.9	0.7
Western Europe	31,820	35,344	0.6	2.1
Oceania	2,681	2,844	3.8	1.2
Others	1,450	1,450	14.0	—
Developing economies	9,271	12,605	5.3	6.3
Africa	717	1,007	13.2	7.0
Latin America	6,427	9,058	3.9	7.1
Asia	2,127	2,540	8.0	3.6
Centrally planned economies	18,666	19,692	1.9	1.1
Asia	2,215	3,166	−3.7	7.4
Eastern Europe	4,401	4,476	3.0	0.3
U.S.S.R.	12,050	12,050	2.8	—

World paper and paperboard capacity, 1985-90

	Capacity (000 metric tons)		Annual average increase	
	1985	1990	1980-85	1985-90
World total	220,394	241,662	2.2%	1.9%
Developed economies	169,521	183,600	2.0	1.6
North America	84,240	89,989	1.8	1.3
Japan	24,043	25,365	2.2	1.1
Western Europe	56,510	63,014	1.9	2.2
Oceania	2,858	3,200	3.8	2.3
Others	1,870	2,032	7.1	1.7
Developing economies	21,519	24,456	5.5	2.6
Africa	832	1,174	2.2	7.1
Latin America	12,234	13,686	5.7	2.3
Asia	8,453	9,596	5.6	2.6
Centrally planned economies	29,354	33,606	1.5	2.7
Asia	8,792	12,534	−0.9	7.3
Eastern Europe	6,562	7,072	1.5	1.5
U.S.S.R.	14,000	14,000	3.1	—

Source: FAO Pulp & Paper Capacities 1980-1990.

paperboard capacity over the next five years is expected to occur in the centrally planned economies of Asia, eastern Europe, and the U.S.S.R., which will grow at 2.7% annually compared with 1.5% during 1980-85, according to the FAO. The developing market economies will be a close second, growing at a 2.6% average annual rate through 1990—almost a 50% slowdown compared with 1980-85.

The developed countries will still account for about 76% of total paper and paperboard capacity in 1990. Developing countries will increase their share to about 10.1% by 1990—up only about 0.4% from 1985 levels and 1.8% from 1980. Centrally planned economies will account for 13.9% of paper and board production in 1990, compared with 13.3% in 1985 and 13.8% in 1980.

Paper grades. The FAO reports that increases in capacity for the main paper grades for 1985 were slightly higher than had been predicted in 1984. Newsprint capacity increased by 0.5 million tons to 31.7 million tons in 1985 and is expected to increase to 33.9 million tons by 1990. Annual capacity growth for newsprint during 1985-90 is estimated at 1.3% compared with 2.3% during 1980-85. By 1990, developed nations will account for about 83% of newsprint capacity, but newsprint capacity growth in these countries will increase by only 1.1% during the period. Developing countries will experience a 3.1% annual rise in newsprint capacity through 1990, down from the 9.5% rate for 1980-85.

Capacity growth for printing/writing grades is still going strong. In 1985, the world had capacity for 57.3 million tons of these grades, and this is expected to grow by 3.0% to 66.6 million tons by 1990, according to the FAO. Growth from 1985 to 1990 will be 1.0% lower than from 1980 to 1985. 1985's capacity increase of 2.5-million-ton over 1984 outperformed the FAO's earlier predictions, largely because People's Rep. China increased capacity by 0.6 million tons more than predicted.

In 1985, world capacity for other paper and board grades was 131.2 million tons, an increase of 4.8 million tons over 1984, the FAO reports. Growth through 1990 is predicted to be 9.7 million tons, amounting to 141 million tons by 1990.

Pulp grades. Worldwide market pulp capacity in 1985 was about 31 million tons. This is expected to rise by 3% to 32 million tons by 1988. The FAO breakdown (in million metric tons): North America, 13.4; Scandinavia, 6.2; rest of Europe, 3.2; U.S.S.R., 2.0; Latin America, 2.3; Oceania, 1.0; and developing Africa, 0.5.

Chemical paper-grade woodpulp capacity was about 104.4 million tons in 1985, and this is expected to increase by 7.1 million tons by 1990. The FAO reports that chemical pulp accounted for 63% of total paper-grade pulp in 1985. Developing countries will watch their woodpulp capacity increase by 7.4% during 1985-90, while developed economies will experience a slight 0.8% increase.

Mechanical pulp capacity in 1985 fell 0.4 million tons from 1984, attributed mostly to reductions in developed markets. By 1990, output is to drop by 0.1 million tons to 25.2 million tons. Most of the output is from coniferous raw material.

Thermomechanical pulp is picking up the slack. Capacity grew by 0.7 million tons from 1984 to 1985, with 4.2 million more estimated to come onstream by 1990, bringing the total to 15.5 million tons. In 1985, about 96% of TMP was produced in developed countries (53% in North America). The FAO survey shows that over half the expected capacity growth will occur in western Europe (2.3 million tons). Most of the rest will take place in North America (1.5 million tons).

About 90% of nonwoodpulp is produced in developing countries, accounting for about half of their paper pulp capacity in 1985. Capacity of other-fiber pulp is expected to grow by 3.5 million tons to 16.7 million tons by 1990. People's Rep. China accounts for half of world capacity. India contributes 15%.

The ratio of total world pulp to paper capacity for 1985-90 is expected to stabilize between 74% and 74.5%. ■

CAPITAL SPENDING

U.S. paper industry spending to drop 8% this year

U.S. pulp and paper companies will spend 7.8% less on new plant and equipment in 1987 than in 1986, according to a new survey conducted by the Commerce Dept.'s Bureau of Economic Analysis. The government report, based on figures gathered during October and November of last year, forecasts total spending of $8.17 billion in 1987, down from $8.89 billion in 1986.

The decline would be the first since 1983, and it would be the largest drop in capital outlays since the recession year of 1982, during which spending fell 11.2%. Paper industry expenditures have set new records each year since 1984.

The 1986 total of $8.89 billion is up 3.5% from 1985. The new estimate for 1986 spending is also up slightly from Commerce's July/August estimate of $8.59 billion. The pace of spending was greatest in the fourth quarter, as usual. The annualized spending rate rose from $8.61 billion in the first quarter of 1986 to $9.02 billion in the second. Spending dropped to a rate of $8.68 billion in the third quarter before jumping to $9.19 billion in the final period.

Revival ahead? The Commerce report echoes two other recent surveys in the direction spending will take in 1987, but the government forecast calls for a much less severe drop. McGraw-Hill Economics forecasts a 24% decline in spending for 1987, while a new *Pulp & Paper Project Report* survey shows a drop-off of 19% in spending for the 1986-88 period compared with 1985-87.

One reason for this year's decline in spending is that the U.S. paper industry went through a major round of capacity expansion in 1986. Nine paper machines—almost all on printing/writing grades—started up last year in the U.S., but only two large machines (Fort Howard Paper Co. and Georgia-Pacific Corp.—both are tissue units) are scheduled to go online this year.

Because it does show less decline than the earlier surveys, the Commerce report may signal a change of heart among U.S. paper companies. Market conditions have been improving, and most analysts expect a sizable jump in both U.S. and Canadian paper industry profits. Rising prices for most grades are improving potential return on investment for major capacity expansions. And rising operating rates—particularly in such tight grade segments as newsprint and linerboard—may push companies to expand in order to meet future customer requirements.

On the tax front, the final bill was not as onerous for industry as earlier versions, and planners no longer have

U.S. WASTEPAPER CONSUMPTION AND EXPORT SHIPMENTS CONTINUE TO RISE

Far East exports show fastest growth as European market faces glut; flow control ordinances, contaminants make future supply uncertain

By DEBRA ADAMS GARCIA, Senior News Editor

Paperstock supplies from the U.S. in 1986 continued to meet the rise in demand of paper mills around the world as well as domestically. Consumption in the coming years is expected to continue to grow, but available supply may shrink. At the same time, the focus of U.S. export opportunities will shift to Asia from Europe.

European demand for imported wastepaper has declined over the past several years, and Europe has become almost self-sufficient. In fact, recyclable paper collections in Europe last year were so high that prices, at least for the lower grades, fell dramatically.

In Asia, however, orders for paperstock remained robust through the first three quarters and much of the fourth quarter. Prices, too, held up. Japan has been able to supply much of its own requirements for wastepaper. Rep. Korea and Taiwan, though, have become major U.S. customers and, People's Rep. China and India have increased their consumption in recent years.

World consumption of wastepaper reached 63.4 million short tons in 1985, a gain of nearly 2.2% over 1984. Much of these additional tons were used in Asia. Europe's usage rose 2.8% to 22.9 million tons. Consumption in Latin America, Africa and Australasia was about flat. North American demand, however, fell 4% to nearly 18 million tons.

For U.S. paperstock dealers, overseas shipments are important. Usually, when domestic demand is slack, overseas demand manages to compensate. In 1985, 3 million out of the world's 7.8 million tons exported came from the U.S. Europe's exports also topped the 3-million-ton mark; however, 2.5 million tons of this was traded by European Economic Community (EEC) countries, mainly within common boundaries.

U.S. EXPORTS UP. Total U.S. paperstock exports in 1985 exceeded the previous year's level by just 0.5% to 3.284 million tons. The three largest customers—accounting for 57.5% of the total—were Taiwan (757,024 tons); Rep. Korea (675,732 tons), and Mexico (456,543 tons).

Exports were one reason why U.S. paperstock prices escalated steadily and significantly during 1986 (Table 1). In December, No. 1 news prices had increased by 50% or more from a year earlier. Old corrugated container OCC prices doubled. Hard white shavings levels rose by as much as 85%. Computer printout prices, though, were up by less than 20%.

Continued strong demand from Asian countries, a rise in demand from Europe and other areas, plus a modest improvement in U.S. consumption is expected to keep prices relatively stable through at least the early part of 1987, market observers indicated.

In the U.S. in 1986, about 22 million tons of wastepaper were expected to be collected for recycling, according to the American Paper Institute. Of this total, 18.3 million tons were used as raw material in U.S. mills, and 3.7 million tons were exported.

Currently, wastepaper accounts for 25% of the fibrous material used by the paper industry in the U.S. By 2000, API forecasts that total collections will exceed 30 million tons. However, supply may not keep pace with the rapid expansions in secondary fiber usage worldwide.

Canada expects to continue to increase its consumption of wastepaper at paper and board mills in the coming years, and this will mean a bigger reliance on U.S. supplies, according to the Canadian Pulp & Paper Assn.

CPPA statistics show Canadian mills used 1.8 million tons of secondary fiber furnish during the first five months of 1986, about 12% more than a year ago. Of this total, about 550,000 tons were imported from the U.S.

OCC accounts for about 50% of this total, and pulp substitutes make up 22% of the amount. Canadian paperstock prices increased significantly throughout the year, except for newspaper grades.

According to CPPA, the oversupply situation that characterized the Canadian market for so many years has now been corrected. Assisted by offshore competition for available supply of wastepaper, the market is now in balance. This trend is expected to continue through 1987.

EUROPEAN MARKET GLUTTED. However the market has not been as good in Europe. Although paper and

TABLE 1: **U.S. wastepaper exports (short tons).**

Grade	Jan.-Oct. 1986	Jan.-Oct. 1985	% change 1986 vs 1985	Jan.-Oct. 1981	% change 1986 vs 1981
News	635,909	499,096	27.4	361,569	75.9
Deinking	357,696	237,165	50.8	105,379	239.4
Pulp subs	267,014	143,360	86.3	166,588	60.3
Corrugated	1,268,156	1,095,181	15.8	853,770	48.5
All other	558,446	763,913	-26.9	402,797	38.6
Total	**3,087,221**	**2,738,715**	**12.7**	**1,890,103**	**63.3**

Source: National Assn. of Recycling Industries from Dept. of Commerce.

board mills in Europe operated fairly well in 1986—enabling them to raise prices in such key grades as pulp, linerboard and newsprint—excess collections of recyclable paper caused a glut that weakened the market for paperstock.

Wastepaper prices in France and Fed. Rep. Germany plunged in the third quarter from second-quarter levels. Part of the problem with the French market was thought to be loss of business with Italy due to the increase in Italian imports of U.S. paperstock. West German exports into north and east France also weakened prices. But, in the U.K., the market stabilized except for some distressed-priced lower grades.

In Italy and Switzerland, high grade prices were affected in the fourth quarter by uncertainty over pulp prices. The situation was not expected to change through year-end, and paperstock that was collected but not sold to paper and board mills ended up in the refuse pile.

Bureau International de la Récupération Paperstock Div. president David Stansfield reported at mid-year that European paper mills had never before experienced such an available reserve of paperstock. Compared with early-1985 prices, mid year prices had fallen by 60% to 80%, reaching record lows, said Stansfield. The higher grades were not as depressed, and collections of the lower grades were being curtailed in an effort to stop further erosion.

In the U.S., however, 1986 was a good year for paperstock recyclers. Wastepaper use by the nation's paper and board mills was up about 8.6% through October from a year earlier, according to API.

At this rate, an estimated 17 million tons of wastepaper will have been consumed by U.S. mills by year-end, estimates the National Assn. of Recycling Industries. At the same time, export shipments were expected to be up about 11% to more than 3.7 million tons.

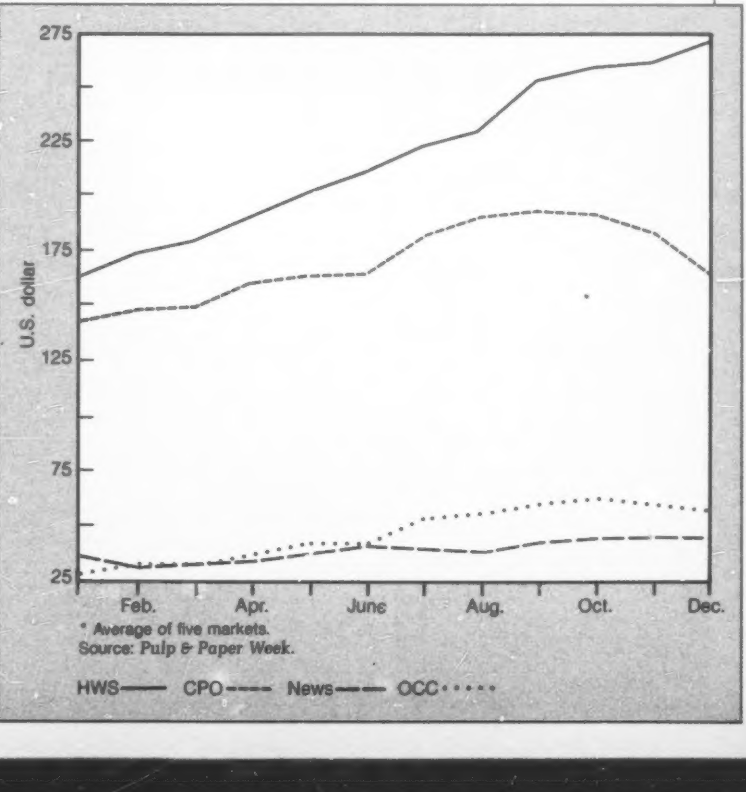
FUTURE SUPPLIES QUESTIONED. U.S. industry observers, though, look with caution to the years ahead. Flow-control ordinances in the U.S. threaten to disrupt supply lines as more waste-to-energy plants are built. More than 233 of these plants will be in place by the year 2000, according to API. Recycling in the U.S. now removes an estimated 15% of the paper headed for the solid waste stream.

"The implications are ominous, particularly since many of these new facilities are planned in regions of the greatest wastepaper consumption," notes Fred D. Iannazzi, president of Andover International Associates.

The recovery of OCC in the U.S. grew from about 6.2 milion tons in 1976 to 8.4 million tons through 1983, an increase of 4.6%/year, noted Iannazzi. This growth rate was more than double that of U.S. consumption of containerboard, the source of OCC supply.

The result was an increase in the OCC recovery rate from 37% to 44%. Most of the increased OCC usage oc-

FIGURE 1: **U.S. wastepaper prices for 1986.***



* Average of five markets.
Source: Pulp & Paper Week.

TABLE 2: **Wastepaper recovery, consumption and trade in 1984-85 for selected countries.**[1]

Country	Recovery		Consumption		Imports		Exports		Utilization rate (%)[2]		Recovery rate (%)[3]	
	1984	1985	1984	1985	1984	1985	1984	1985	1984	1985	1984	1985
Belgium	526	530	219	225	67	85	373	390	26	27	32	33
Denmark	275	275e	240	223	37	32	72	100	68	69	29	30
France	1,922	1,936	2,200	2,221	399	373	500	476	40	42	35	34
Germany, West	4,120	4,371	3,986	3,991	610	565	767	911	44	43	38	41
Greece	80	130	100	150	15	12	0	0	33	46	17	25
Italy	1,393	1,313	2,038	2,014	646	702	1	1	44	44	26	25
Netherlands	1,133	1,148	1,107	1,158	451	463	491	443	59	61	46	46
United Kingdom	2,174	2,171	2,003	2,067	85	92	256	196	55	55	28	28
EEC	**11,623**	**11,874**	**11,893**	**12,049**	**2,310**	**2,324**	**2,460**	**2,517**	**45**	**46**	**32**	**33**
Finland	301	342	281	283	34	23	65	85	4	4	21	25
Norway	118	131	112	120	32	32	40	42	7	7	20	23
Sweden	719	763	731	756	125	180	149	130	11	11	38	39
Nordic	**1,138**	**1,236**	**1,124**	**1,159**	**191**	**235**	**254**	**257**	**7**	**7**	**29**	**32**
Austria	368	377	701	814	402	491	70	53	36	38	39	38
Portugal[4]	220	227	220	230	5	7	5	4	34	36	43	44
Spain[4]	1,225	1,291	1,579	1,669	370	395	16	17	54	57	41	44
Switzerland	494	503	431	449	102	107	165	161	44	44	44	43
Other W. Europe	**2,307**	**2,398**	**2,931**	**3,162**	**879**	**1,000**	**256**	**235**	**45**	**47**	**41**	**43**
Bulgaria	50e	50e	50e	50e	0	0	0	0	13e	13e	10e	10e
Czechoslovakia	563	537	390	396	0	0	146	141	31	31	45	42
Germany, East	637	647	643	664	9	22	13	10	50	51	47	47
Hungary	288	282	288	292	0	10	0	0	57	59	43	42
Poland	478	456	418	425	0	0	68	31	34	34	38	34
Romania	275e	275e	260e	260e	0	0	0	0	32e	32e	40e	40e
USSR	1,900e	1,900e	1,700e	1,800e	0	0	200e	200e	17e	18e	21e	21e
Yugoslavia	425	430	560	567	135	137	0	0	42	42	36	36
E. Europe	**4,589**	**4,577**	**4,309**	**4,454**	**144**	**169**	**427**	**382**	**26**	**26**	**28**	**28**
Total Europe	**19,657**	**20,085**	**20,257**	**20,824**	**3,524**	**3,728**	**3,397**	**3,391**	**31**	**32**	**32**	**32**
Canada	997	1,000e	1,463	1,442	605	520	161	190	10	10	20	20
USA	18,424	17,868	15,172	14,535	100	79	2,934	2,981	24	23	27	26
North America	**19,421**	**18,868**	**16,635**	**15,977**	**705**	**599**	**3,095**	**3,171**	**22**	**21**	**26**	**26**
China	1,442	1,724	1,350e	1,650e	0	0	0	0	18e	18e	18	18
Hong Kong	450e	450e	35e	40e	0	0	415e	410e	100e	100e	57e	54e
India	450e	500e	650	700	250	200	0	0	48	44	29e	29e
Indonesia	100e	100e	125e	125e	40e	40e	0	0	33e	26e	16e	14e
Japan	9,635	10,152	9,700	10,442	312	300	8	18	50	51	50	52
Korea, Rep.	729	817	1,410	1,518	681	701	0	0	64	66	33	36
Malaysia	80e	80e	20e	20e	0	0	50e	50e	28e	27e	21e	20e
Philippines	45	45e	102	97	61	58	0	0	40	44	11	12
Taiwan	900	901	1,840	1,860	945	959	0	0	95	92	47	44
Thailand	130e	130e	250e	250e	120e	120e	0	0	76e	71e	25e	25e
Turkey	150e	150e	150e	150e	2e	2e	0	0	31	22e	29e	21e
Asia	**14,111**	**15,049**	**15,632**	**16,852**	**2,411**	**2,380**	**473**	**478**	**45**	**44**	**37**	**36**
Australia	494	557	476	523	5	1	23	35	31	34	22	25
New Zealand	104	111	96	98	0	0	8	13	14	13	24	19
Australasia	**598**	**668**	**572**	**621**	**5**	**1**	**31**	**48**	**25**	**27**	**25**	**23**
Argentina	350e	280e	342	270	0	0	0	0	36	32	36	32
Brazil	140e	140e	141e	141	1e	2	3e	3	3e	3e	4e	4e
Chile	51e	51e	51e	51e	0	0	0	0	14e	14e	17e	17e
Colombia	157e	157e	163e	163e	6e	6e	0	0	45e	45e	35e	35e
Mexico	919	978	1,453	1,533	533	589	0	0	64	63	41	39
Peru	46e	46e	36e	36e	0	0	0	0	26	26	25	25
Venezuela	197	239	327	355	130	116	0	0	59	65	26	33
Latin America	**1,860**	**1,891**	**2,513**	**2,549**	**670**	**713**	**3**	**3**	**29**	**28**	**19**	**20**
Algeria	35e	35e	35e	35e	0	0	0	0	41	41	21	21
Egypt	31	31e	144	144e	110e	110e	0	0	97	97e	7	7e
Kenya	64	64e	64	64e	2	0	0	0	54	54e	54	54e
Morocco	53	48	72	68	19	22	0	0	64	63	28	27
South Africa	375e	380e	375e	380e	0	0	0	0	27	25	27	29
Africa	**558**	**558**	**690**	**691**	**131**	**132**	**0**	**0**	**33**	**32**	**18**	**19**
World total	**56,205**	**57,119**	**56,299**	**57,514**	**7,446**	**7,553**	**6,999**	**7,091**	**30**	**30**	**30**	**30**

[1] Those selected here represent over 95% of the world's paper and board production and consumption. World totals are based on all countries, not just those selected here.

[2] Wastepaper as a percentage of total paper and board production.

[3] Wastepaper recovery as a proportion of total paper and board consumption.

[4] Since Spain and Portugal did not join the EEC until Jan. 1986, their 1985 results are included under Other Western Europe.

Source: *PPI Annual Review 1986*. e = *PPI* estimate.

curred in the manufacture of kraft linerboard and semichemical medium, noted Iannazzi. Export sales also increased sharply during this period.

Andover International forecasts OCC demand for domestic and export sale will reach about 14 million tons by 1993, involving a recovery rate of about 58%. Iannazzi questioned if there will be adequate supplies to meet these requirements.

Other problems also face recyclers in the coming years. Various contaminants in recyclable paper are causing difficulties in sorting and, ultimately, in customer satisfaction. Hotmelt glues have been a source of frustration for recyclers of corrugated containers in the past. More recently, however, laser printing on computer printing papers has become of greater concern. So far, no technology has been able to disperse laser printing before it ends up in deinking systems, although the Japanese are said to be close to a discovery. Apparently, they are using a chemical which dissolves the laser content; however, it is reportedly costly.

NEW EQUIPMENT DEVELOPED. Suppliers, however, continue to forge ahead to develop new equipment to meet the needs of an expanding number of secondary fiber consuming mills. Escher Wyss has introduced a new system for cleaning circuit water in wastepaper pulping operations. Called the Purgomat, the unit is used to clean backwater such as wash filtrate or whitewater II in the 5 to 9 pH range .

The capacity of the system is 1.800 to 30,000 m³/min. Chemicals are added to the water system to floc unwanted solids. After aeration, the flocced solids are separated as sludges. The clarified water is then pumped off and recycled.

Escher Wyss indicates that chemical costs are low because the unit is computer controlled. Water quality is also kept constant despite load fluctuations by the control system, the company notes.

Lamort, France, reports that it delivered in 1985-86 its Helipoire system for the first time to companies using boxboard container and mixed wastepaper to make fluting, wrapping papers and linerboard. The system normally includes a high-consistency Helico pulper without perforated plate, a dumping Poire with perforated plate, and a high-density cleaner followed by a centrifugal CH screen with holes, working at 4% consistency. Rejects are sent into an auxiliary screen reject Diabolo to remove contaminants.

The company says that although the system absorbs a large amount of energy at the pulper, the absence of a deflaker results in lower average consumer power requirements than with conventional systems.

REPORTS BY COUNTRY. Below are a few country-by-country capsule reports of wastepaper usage.

France. Wastepaper use increased 1.4% during 1985, reaching a level of 41.3% of the industry's total furnish requirements. Overall consumption, however, was down 0.5% to 2.21 million tons due to lower paper industry operating rates. However, while consumption of the lowest and highest grades both fell, demand for the deinking grades grew by 10% from 1984. Prices continued to decline due to high supply levels in the EEC countries throughout the year.

Sweden. Demand for paperstock remained tight in 1985, with consumption reaching a record 833,300 tons or 3% more than in 1984. The highest jump was in newspapers and magazines, which account for almost half of consumption. Despite the glut of wastepaper in Europe, Swedish exports remained high at 143,300 tons compared with 164,250 tons in 1984.

During the first half of the year, the market was about flat from a year earlier. Through the remainder of the year, however, old newspapers/magazines and corrugated declined.

Japan. Paperstock markets have remained sluggish since 1985. The dramatic rises in consumption of prior years have leveled off. Prices began to drift downward in April and continued that trend for much of the rest of the year due to slack demand and static supply. Old news prices dropped by about 30% from a year earlier, and other grades suffered similar losses.

Netherlands. Prices began dropping in the second half of 1985 and continued to decline in 1986, despite relatively good demand. In the first half of 1986, paperstock usage increased 5%. In 1985, 1.276 million tons were consumed, an increase of 5.8% from the previous year. This led to increased imports as domestic supplies were insufficient to meet demand. This trend is expected to continue.

Belgium. An increase in wastepaper consumption in Belgium of 7% to 8% was expected in 1986 and a further rise of 2% to 3% in 1987 due to an increase in industry operating rates. Exports were expected to remain flat in 1986, although imports should drop. Prices remained low during the year, dropping by nearly 50% for the low grades, while the higher grades declined by 10% to 20%. The situation was not expected to change until 1987.

Finland. During the first half of 1986, collections rose by about 6%, with corrugated alone up 15%. Wastepaper consumption, however, was 10% lower than a year earlier, with paperstock supplies at about nine weeks at the mill level.

United Kingdom. A growth of 3% in wastepaper consumption in 1985 did not continue in 1986. Instead, there was a slight fall starting early in the year and static conditions for much of the year. Supplies were overabundant due to a reduction in exports and a higher collection level throughout Europe.

As a result, prices for the the bulk grades declined 40% to 50%. Pulp substitute prices, however, were kept stable by a strong pulp market until the third quarter. By late in the year, though, processors had stopped accepting recyclable paper from charities. ■

PULP & PAPER

March 1987

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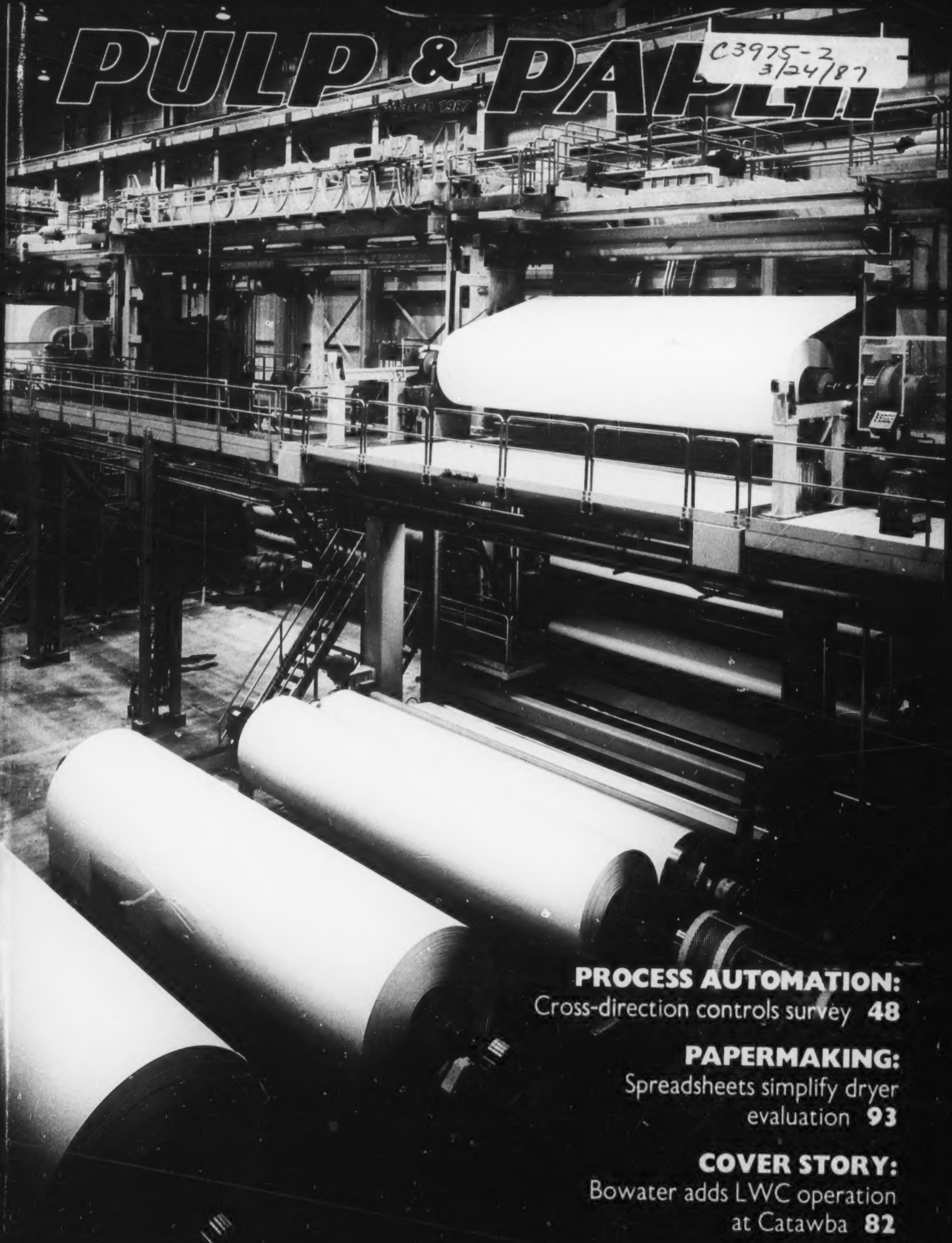

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(Photo courtesy of Bowater Carolina Co.)

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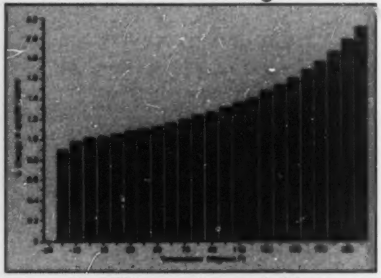

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PULP & PAPER (ISSN 0033-4081) is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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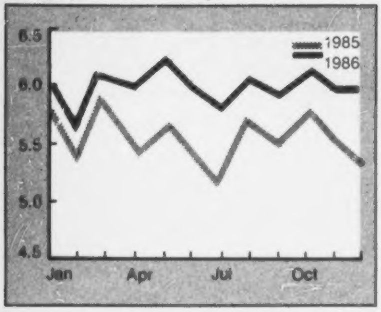


U.S. paper and board production

U.S. production of paper and paperboard totaled 5.9 million tons in December, up a very strong 9.9% from the previous year, according to American Paper Institute data. Output was unusually strong in December, the API said, as many producers kept machines running through the holiday shutdown period to keep up with heavy demand. Thanks to the strong December finish, production for the year topped 71.0 million tons. That is 5.9% higher than in 1985 and 3.7% above the previous record set in 1984.

Among major grades, record fiber box demand fueled a 7.6% increase in containerboard production for domestic use. Total linerboard exports jumped almost 20%, thanks to a steep decline in the value of the dollar. Continued growth in markets for computer, office, and offset papers fueled a 7.7% rise in uncoated free-sheet shipments for the year. Newsprint production rose 3.7% compared with 1985, while operating rates climbed to 96% of total capacity.

Canadian newsprint shipments ended the year at 9.3 million tons, up 3.4% from 1985. Operating rates reached 94%, up from 92% in 1985. Woodpulp shipments jumped 9.5% for the year, with operating rates of 92%, up from 87% in 1985. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Dec.	472	7.8	5,630	3.7
Uncoated groundwood (s)	Dec.	124	10.7	1,523	0.5
Coated paper (s)	Dec.	540	20.5	6,260	6.6
Uncoated free sheet (s)	Dec.	881	8.4	10,504	7.7
Other printing/writing	Dec.	108	−0.9	1,384	3.1
Total packaging and other paper (s)	Dec.	424	3.4	5,137	−1.3
Tissue	Dec.	424	3.4	5,096	3.1
Total paper	**Dec.**	**2,972**	**8.5**	**35,534**	**4.4**
Unbleached kraft paperboard	Dec.	1,531	16.4	17,694	7.7
Semichemical medium	Dec.	438	5.8	5,373	5.6
Bleached paperboard	Dec.	365	10.6	4,293	8.7
Recycled paperboard	Dec.	625	4.5	8,143	6.7
Total paperboard	**Dec.**	**2,959**	**11.4**	**35,503**	**7.5**
Total U.S. paper and paperboard output	**Dec.**	**5,931**	**9.9**	**71,036**	**5.9**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Nov.	4,781	6.3	57,256	5.5
Market pulp production	Nov.	651	11.3	7,508	10.2
Wastepaper consumption at paper/board mills	Nov.	1,398	8.7	16,626	8.2
Pulpwood consumption (cords)	Nov.	7,681	8.0	91,243	6.1
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	Dec.	22.03	12.4	283.62[6]	6.0
Containerboard inventories at U.S. box plants and mills	Dec. 1	2,138	−13.4		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Nov.	1,134	23.8	11,743	5.4
Imports of Canadian newsprint	Nov.	767	14.1	8,390[6]	3.2
U.S. paper exports (including products)	Nov.	396	22.6	4,681	16.7
Exports of unbleached kraft linerboard	Nov.	175	38.9	2,159	19.5
Exports of woodpulp	Nov.	312	−14.0	4,417	15.8
Norscan pulp inventories[4]	Dec. 31	870	−33.0		
Norscan pulp operating rates[4]	Dec.	95%	97%	96%	93%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Dec.	815	4.9	9,302[6]	3.4
Operating rates	Dec.	96%	87%	94%	92%
Inventories held by U.S. consumers	Dec. 31	1,257	−9.8		
Other paper/board shipments	Dec.	485	19.2	6,017	10.4
Woodpulp shipments (export only)	Dec.	689	9.7	7,674	9.5
Operating rates	Dec.	88%	78%	92%	87%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

COATED FREE-SHEET: Analysts expect healthy growth of product demand in 1987

Grade structure: Coated free-sheet grades consist of papers made from no more than 10% groundwood pulp, most commonly stone groundwood; the balance is chemical pulp. Coated Nos. 1 and 2, at the top of the quality range, have no groundwood content at all, while Nos. 3 and 4 may contain small amounts or none. About half of the No. 4 group is excluded from the free-sheet category due to groundwood pulp content. Most coated free-sheet paper (93%) is coated two-side (C2S). Most of the 385,000 tpy of coated one-side paper (C1S) is free-sheet.

Basis weights for premium coated Nos. 1 and 2 are generally between 60 and 100 lb, while Nos. 3 and 4 generally are in the 25-to-90-lb area. Most coated free-sheet is used by commercial printers. The largest end uses are annual reports, catalogs, and other advertising and promotional materials. An important end use is in magazines for cover stock and higher-grade interior pages for artistic and other first-class publications. About 10% of No. 3 is used by magazine publishers.

Coated papers come in glossy, dull, matte, and embossed finishes. Measurements of these finishes (Gardner gloss meter) are 45 or more for glossy, as low as 25 for dull, and 20 or below for matte.

A survey conducted in the early 1980s estimated that about 65% of all No. 1 was glossy and 35% was dull, with a very small share for matte and embossed. For No. 2, about 80% was glossy and 16% dull. For No. 3, the division was 63% glossy, 33% matte, and 3% dull. Embossed represents less than 2% of any grade.

Production/capacity: Analysts predict that operating rates will remain at a healthy 92% to 93%, about the same as 1986. Output of coated free-sheet from U.S. mills rose 1.7% in 1986 from 1985 but will jump to somewhere near the greater-than-7.8% rise in capacity in 1987, to about 3.1 million tons.

Scott Paper Co.'s S.D. Warren Div. in Skowhegan, Maine, brought its 215,000-tpy coated free-sheet machine online near the end of 1986. No new machines are definitely set for 1987, although Westvaco Corp. will add 30,000 tpy this year and 30,000 tpy in 1988, the final years of a five-year, 150,000-tpy program at its Luke, Md., mill. Mead Corp. will add 20,000 to 30,000 tpy at its Escanaba, Mich., mill through machine speedups and operating improvements. Midtec Paper Corp. will rebuild its off-machine coater at Kimberly, Wis.

Outlook: Future demand growth outlook for coated free-sheet grades is optimistic. Demand for coated free-sheet premium grades was rising as 1986 gave way to 1987, due in large part to demand for annual reports. Consumption is expected to be 4% to 5% higher in 1987 than in 1986 (based on *Blue Chip Economic Indicators*).

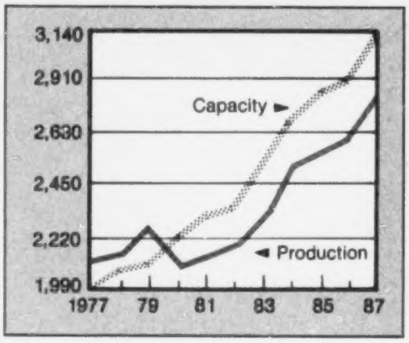
Backlogs were extending out past four or five weeks in some cases by the end of 1986.

Prices: Discounts plagued coated free-sheet grades throughout most of 1986, but at least four producers had announced price hikes for premium grades by Jan. 1, 1987. The $1,375/ton list price for No. 1, +70-lb in sheets had lasted since the beginning of 1985 and had suffered discounts to, and below, $1,325. However, a $40/ton price increase was instituted at the beginning of the year by four producers. The hike also affected No. 3, which rose from a $980/ton list to $1,020. However, the discounting that brought No. 3 to an average transaction price of $920 throughout 1986 continued into the new year. Scott's S.D. Warren Div. failed to support the hike, but observers expect the $40 increase to be in place about mid-year.

Typical historical pricing trends ($/short ton, average price for year) are as follows for 70-lb No. 1 sheets: 1978, $880; 1979, $939; 1980, $1,021; 1981, $1,096; 1982, $1,148; 1983, $1,213; 1984, $1,321; 1985, $1,375; 1986, $1,350. For No. 3 rolls: 1978, $621; 1979, $690; 1980, $750; 1981, $798; 1982, $798; 1983, $830; 1984, $919; 1985, $980; 1986, $940 to $950.

Markets: Commercial printing remains the largest consumer of C2S paper, while C1S is used primarily by label converters and wrap manufacturers. A substantial minority of No. 4 goes to magazine publishers, as does No. 3, either of which can be used for magazine cover stock. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1985[3]	1986[1]	1987e
Production[1]	2,618	2,640	2,849
Capacity[2]	2,845	2,892	3,120
Utilization rate	92.0%	91.3%	91.3%
Imports	103	100	114
Exports	39	41	57
Apparent U.S. consumption	2,682	2,699	2,906
lb/capita	22.40	22.34	23.90
GNP ratio	1.50	1.47	1.54

1. *P & P* estimate.
2. API capacity survey.
3. Revised

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Scott Paper[1]	850	27.2
2. Westvaco	475	15.2
3. Mead Corp.	415	13.3
4. Champion Intl.	265	8.5
5. Potlatch[2]	220	7.1
6. Consolidated	215[3]	6.9
7. Simpson	185	5.9
8. Midtec	137	4.4
9. Newton Falls	100	3.2
10. Boise Cascade	54	1.7

Market share of top five companies:
71.3

Market share of top ten companies:
93.4

Total U.S. capacity (1987):
3.120 million tons

1. S.D. Warren Div.
2. Northwest Div
3. *P & P* estimate.

SALES & EARNINGS

1986 earnings rose, thanks to weak dollar

The U.S. paper industry is on a roll: 1986 earnings were up 29.7% from 1985. Sales improved 4.4% in 1986. Paper/forest products companies in the fourth quarter enjoyed their third consecutive rise in earnings. Producers of market pulp, linerboard, and uncoated free-sheet showed the biggest gains.

As was true most of last year, the weak U.S. dollar deserves much of the credit, helping to boost export volume and prices. The improvement in export markets helped the domestic supply/demand balance for many commodity grades and enabled producers to push through price increases from depressed 1985 levels. The beneficial effects of cost-cutting programs have begun to kick in. And despite the loss of investment tax credit under the new tax law (retroactive to Jan. 1, 1986), many companies still recorded substantial improvements in earnings during the latest quarter.

As George Weyerhaeuser, president and CEO of Weyerhaeuser Co., put it, "for the first time in the 1980s, all the major domestic and international market trends are working in our favor."

International Paper Co., the nation's largest paper company, saw income from its continuing operations more than double to $305 million compared with a 48% decrease from 1984-85. John A. Georges, chairman and CEO, attributed the turnaround to the dollar and "stringent cost-reduction efforts, improved productivity from major capital programs, and lower energy prices." As for this year, Georges predicted the earnings momentum would continue, "absent a downturn in the economy or any unfavorable trend in the value of the dollar."

Second-largest James River Corp. (on a fiscal year) reported an 85% increase in sales for its second quarter ended Oct. 26., excluding a $19.4-million charge inflicted by the new tax law. The company said the strong performance was due to the acquisition of Crown Zellerbach Corp. and better prices in uncoated white printing paper and pulp. It noted prices "remained highly competitive in consumer towel and tissue products and disposable food service products, although strengthening occurred at the end of the quarter in both food service and away-from-home towel and tissue products."

Champion International Corp. recorded a 23% improvement in earnings to $200.8 million, although sales of $4.38 billion were off 24%. The company said its restructuring program, effective July 1, 1986, resulted

U.S. paper/forest products industry results for 1986.

	Full Year ($000)			
Paper companies	**Sales**	**Change 1986/85**	**Earnings[1]**	**Change 1986/85**
Boise Cascade	$3,790,640	1.4%	$ 101,540	−2.6%
Bowater Inc.	919,690	1.7	49,444	−26.7
Champion International	4,387,623	−24.0	200,832	23.1
Chesapeake Corp.	599,770	33.4	13,738	−12.5
Consolidated	653,040	−8.7	87,542	−18.1
Federal Paper	948,560	21.0	33,363[2]	199.5
Fort Howard	1,549,290	13.6	146,391	−6.8
Georgia-Pacific	7,223,000	7.5	295,933[2]	57.4
Great Northern Nekoosa	2,040,000	5.2	85,300	84.6
International Paper	5,500,000	22.2	305,000[2]	129.3
James River (10/26)				
Jefferson Smurfit	944,356	49.6	26,003	66.4
Kimberly-Clark (10/26)	4,303,100	5.6	269,400[2]	0.86
Longview (10/31)	487,685	6.2	33,484[2]	49.4
Louisiana-Pacific	1,506,200	19.5	64,910	164.5
Mead Corp.	3,217,700	17.4	109,300[2]	13.0
Pope & Talbot	289,085	−10.0	15,815	137.9
Potlatch Corp.	976,373	2.7	69,943	65.7
Scott Paper	3,437,000	12.7	186,500[2]	−7.2
Sonoco Paper	963,796	10.8	54,676	10.7
Southwest Forest	631,467	8.5	7,228[2]	n.m.
Temple-Inland	1,295,800	4.2	80,800	−6.1
Union Camp	2,045,215	9.6	129,904	36.6
Wausau (11/30)				
Westvaco (10/31)	1,611,937	5.2	108,096	3.3
Weyerhaeuser	5,652,029	8.6	276,885	38.3
Willamette	1,200,155	4.2	74,665	23.9
Total	$66,373,481	4.4%	[illegible]	29.7%

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Federal Paper Board:** Year excludes $15.1-million charge for early redemption of notes. **Georgia-Pacific:** Year includes $33-million gain from sale of certain stock and warrants. Year net excludes $17-million gain from change in accounting for pensions and cumulative effect of new timber capitalization program. 1985 quarter and year net exclude $10-million gain from court settlement. 1985 year excludes $30-million loss from discontinued operations. 1985 net excludes $19-million gain from sale of timberlands. **International Paper:** Year includes $10-million net gain relating to sale of headquarters building. Full year net also includes these pretax items: $32-million gain on offerings of depository units of IP Timberlands Ltd.; $44-million gain from change in pension accounting; $20-million loss from rise in income taxes. 1985 net includes $56-million gain on IP Timberlands offering; $12-million loss from discontinued operations; $29-million charge for early retirement program. Note: **Hammermill Paper** will not publish annual results for 1986 since it was purchased by IP. **James River:** Excludes a $19.4-million charge due to impact of Tax Reform Act. Note: Sale of Crown Zellerbach Corp.'s Distribution Group to Mead Corp. in September did not have a significant impact on James River's earnings. **Louisiana-Pacific:** 1985 year net excludes $29.4-million gain due to change in accounting method for investment tax credit. **Mead:** Year net excludes $65.9-million loss from discontinued operations. **Scott Paper:** 1986 net includes $35-million pretax loss from effects of new tax law and nine-week strike at Mobile, Ala., mill. **Southwest Forest Industries:** Year net excludes $10.395-million charge related to the conversion of debentures.

n.m. = Not meaningful.

in cutting corporate expense by $84 million to $62 million.

Field day for market pulp. Weyerhaeuser Co. enjoyed record sales for the fourth quarter of $1.45 billion—a 17% improvement over the year-earlier quarter. For the year, sales improved 8.6% to $5.65 billion while earnings rose 38.3% to $276 million, despite long strikes in Weyco's forest products operations in the Northwest and British Columbia. Again, the weak dollar and cost improvements were lauded. George Weyerhaeuser predicted "pulp and paper product markets in 1987 should be considerably stronger than those of 1986, and recent upward trends in log export prices and volumes should combine with continuing strong demand for wood products in domestic markets." Weyco and other companies that sell timber stand to gain from the 15% export fee Canada recently placed on softwood lumber exports to the U.S.

In addition to experiencing a record year in its building products business, Georgia-Pacific Corp. reaped in the benefits of strong demand for pulp, paper, and paperboard. Earnings for the year showed an increase of 57.4%, to $295.9 million on sales of $7.22 billion.

Great Northern Nekoosa Corp. saw its earnings increase 85% to $85.3 million on sales of $2.04 billion. Chairman of the company, William R. Laidig, said that paper prices are approaching their highest levels since 1984, and he doesn't foresee any sudden backsliding because paper companies haven't added much capacity.

Paperboard surging. Union Camp Corp.'s 1986 sales broke the $2-billion mark for the first time, while earnings rose 36.6% to $129.9 million. Fourth-quarter earnings of $42.8 million were the largest in company history and more than double the 1985 period. Increased shipments of linerboard made up a large part of the 14% increase in paper product shipments that the company enjoyed. It ran its kraft paper and board mills almost full-out last year. Demand was also strong for Union Camp's printing and writing papers. The company expects profits in 1987 to be helped by the price increases for corrugated containers, which are overdue compared with strong linerboard price levels.

Federal Paper Board Co.'s 1986 earnings were about 200% higher than 1985 levels at $33.5 million. Earnings improved quarter-by-quarter because of strong pulp and bleached board markets. John R. Kennedy, company president, noted, "As we begin 1987, all our operations are running well. Order backlogs are generally good, and sales prices are improving." Potlatch Corp. enjoyed an 85% increase in earnings to $69.9 million on slightly improved sales of $976 million.

Tissue holds its own. Tissue producers, dueling in a cut-throat market while paying higher and higher prices for pulp, are holding their ground. Kimberly-Clark Corp. reported record sales and earnings for fourth-quarter and full-year 1986. However, 1986's earnings of $269.4 million were only a 0.86% improvement in earnings over last year. K-C said that U.S. sales of its disposable diaper products improved, "despite higher costs associated with the national introduction of the Huggies Supertrim diaper." Healthy results were also turned in by household products, feminine care, and the professional health care sectors. This year, K-C projects increased sales of disposable diapers will improve its profitability.

Scott Paper Co. enjoyed its third consecutive record year of sales at $3.43 billion. Earnings would have been up about 10% to $221 million except for the combined effects of the new tax law and a prolonged strike at the Mobile, Ala., mill, which amounted to a pretax charge of about $35 million. Scott's worldwide sanitary paper business, including U.S. operations, achieved record sales revenue, increasing 14% to $2.3 billion. Outside of the U.S., earnings from sanitary paper products almost doubled, helped by the weak dollar. Scott's S.D. Warren Co. also had record sales of $921.2 million, up 9% from 1985, helped by strong demand for the division's LWC paper.

Wood products stronger. Louisiana-Pacific Corp. enjoyed record sales and hugely improved earnings in 1986. Sales of $1.5 billion were 22% higher than they were in 1985. "We experienced solid building products markets, aggressive cost control, and a dramatic turnaround in our pulp and paperboard segment," enthused the company's chairman and president, Harry A. Merlo.

Southwest Forest Industries Inc. showed that it had recovered from a tough 1985: earnings were $7.2 million compared with a loss of almost twice that amount in 1985. ■

ACQUISITIONS/MERGERS

Stone Container to get SFI in friendly takeover

Stone Container Corp. has signed a definitive merger agreement to acquire all of the outstanding shares of Southwest Forest Industries Inc. for $32.25 per share. This comes out to approximately $763 million, including assumption of debt and redeemable preferred stock. The agreement will increase Stone's leadership position in the containerboard/corrugated box business and mark the company's diversification into newsprint and market pulp. As in four earlier acquisitions over the past four years, the company will aggressively leverage its financing.

SFI has been the object of takeover speculation for several years, but the deal is a "totally friendly one," according to Stone's senior vice president and chief financial officer, Arnold F. Brookstone. As part of the agreement, SFI directors voted to redeem for $0.25/share the company's shareholders rights, a defense adopted by the company in 1984. Closing, still subject to several conditions, including approval by Southwest Forest Industries' shareholders, is expected to take place in early April.

Major assets to be acquired as part of the agreement include SFI's Snowflake, Ariz., and Panama City, Fla., pulp and paper mills, 19 corrugated box or sheet plants, and a number of wood products plants. In addition, the company owns 334,000 acres of private fee timberland in Florida, Georgia, and Alabama. The Snowflake mill has capacity to produce 280,000 tpy of newsprint on two machines and 160,000 tpy of linerboard on a third machine. The Panama City mill has capacity to produce 280,000 tpy of linerboard on one machine and also has a pulp dryer with which to produce 240,000 of bleached softwood and hardwood market pulp.

Newsprint—a new growth area. Roger W. Stone, chairman and chief executive of Stone Container Corp., described the newsprint and market pulp operations as "important and highly desirable product line extensions," which he said had a very favorable supply/demand outlook.

According to Brookstone, the company has been considering expansion into the newsprint field for quite some time and plans "one way or

Formulators for deinking cut into commodity's share

WASTEPAPER USE UP IN 1986. About 22 million tons of wastepaper were collected in the U.S. in 1986, 83% of which was for domestic use. This is nearly one-quarter of the fibrous raw material used in paper and paperboard operations and represents an 8.6% increase over 1985. The chief reason for the increase was the significant growth of paperboard production and the continued acceptance of integrating wastepaper into furnishes. Exports are also reaching record levels as shipments overseas saw an 11% increase over the previous year.

Domestic use was highlighted by capacity expansion at a number of locations. In the South, Cheaspeake, Interstate, and Packaging Corp. of America collectively contributed over 400,000 tpy to wastepaper use. Temple-Inland opened its new 515-tpd recycled linerboard in Ontario, Calif.

Another half million tons of growth in wastepaper use is proposed in the U.S., and one major project in Canada (Ontario Paper Co. Ltd., Thorold, Ont.) is due online in 1987 with capacity at 170,000 tpy. Many other linerboard mills are using existing or new equipment (primarily pulpers) to facilitate the use of wastepaper in accordance with fiber supply interruptions, machine speedups, and as a production cost reducer. To a lesser extent, market pulp, tissue, and some fine paper producers have made similar moves but only in cases where wastepaper supply (mostly reject material from virgin fiber plants) can be easily collected.

CHEMICAL SALES BENEFIT. Not surprisingly, most chemicals for secondary fiber treatment enjoyed a successful year. The leader among those was the surfactant-based formulations. The consumption of commodity chemicals such as sodium silicate and caustic soda remained flat due to the increased attention of both suppliers and mills to reducing the raw material variations inherent to wastepaper processing. Although commodity surfactants are much cheaper than the specialty formulations, the benefits of service and reliability from a supplier are seemingly more important.

Mills are requesting more from deinking chemicals than in the past. Producers are looking for more cost-effective chemicals to reduce repulping time, control stickies and other contaminants, and enhance production through tonnage increases and/or improved product quality.

Among the more difficult contaminants being challenged in mills and supplier laboratories are laser ink, widely used copier inks, and hotmelt adhesive materials, now seen as a chief source of stickies.

Sodium silicate consumption is decreasing in all deinking systems. The typical addition range, 2% to 6% based on the weight of fiber, is decreasing because of the users' ability to more efficiently use the chemical in combination with new supplier offerings. The detergent action of this combination appears increasingly effective and reduces opportunities for silicate use. Silicate still has a bright future in peroxide stabilization, influent treatment, and as a strength/fire-retardent additive in converted paper products.

The prices of deinking chemicals did not change much in 1986, and no new changes are expected for this year. Sodium silicate has remained level throughout this decade, but caustic has fluctuated due to shifts in supply and technology by the major chloralkali manufacturers. Sources say that the 1990s may bring an upward cost spiral for chloralkali products because of the changes made during the 1980s. The formulated products span a wide cost range, but usually they fall between $1 and $2/lb. Suppliers mentioned that no price hikes will occur in 1987.

One company on the move in specialty chemicals is PPG Industries. PPG has acquired Santek (Appleton, Wis.), Mazer (Gurnee, Ill.), and Jordan (Folcroft, Pa.); the first two already supply the paper industry with process aids, mostly on a customized basis. PPG has for many years been a chloralkali supplier, but with a strong company based in papermaking aids (Santek) and one to supply the components (Mazer), PPG has moved toward being a major supplier of specialty chemicals to the industry.

EMPHASIS ON QUALITY. The demand for more attractive products in newsprint and tissue is putting pressure on manufacturers to offer a higher-quality basestock to printers and converters. Deinked pulp is becoming whiter, brighter, and more flexible for further processing due to these factors. One chemical receiving more attention as a process aid is hydrogen peroxide. Peroxide attacks the ink binder and assists in making the binder soluble.

— *Michael Ducey*

TABLE 1: **Consumption and price of chemicals used in secondary fiber processing.**

Chemical	Recycling (short tons)	Change (1986/1985)	All industry (000 short tons)	Price[1] ($/lb)
Caustic	13,100	6.5%	11,900	0.975
Sodium silicate	11,500	−1.0	823	0.1570
Hydrogen peroxide	5,500	8.6	9,150	0.325[2]
Surfactants	14,000[4]	10.0	3,800,000	0.75-2.10[3]

[1] Source: *Chemical Marketing Reporter.*
[2] 50% basis.
[3] Represents a range corresponding to use in formulations used to suppliers to the pulp and paper industry.
[4] Adjusted number.

CROSS-DIRECTION CONTROL SALES HAVE DOUBLED IN THE PAST TWO YEARS

Exclusive *P&P* survey finds that CD actuators are now standard equipment on machines; more than 1,800 systems are installed

By KENNETH E. SMITH, Executive Editor

In its February 1985 issue (p. 72), *P&P* surveyed cross-direction (CD) paper machine control installations and found that 960 actuators had been sold and installed under closed-loop control worldwide through the end of 1984. The first CD actuators—caliper controls on newsprint machines—were installed in 1973. Since that time, CD control of basis weight, moisture, and caliper has gained universal acceptance. The increase in the number of installations during the 1980s has been dramatic. *P&P* again surveyed CD installations and found that the number has almost doubled in the past two years,* thanks to increased industry emphasis on quality, improved sensors and actuators offered by existing vendors, and expansion of the market through several new vendors. Through the end of 1986, an estimated total of 1,827 CD controls had been installed (Figure 1).

There are several theories as to which CD control is the most important, and, of course, this will vary with grade. One theory says that basis weight is the most important since an uneven weight profile will have an adverse effect on moisture and caliper. Moisture is said to be the easiest application to justify economically since evening moisture profile usually allows a higher target sheet moisture to be run. Caliper is extremely important to printing/writing grades; however, most new machines in this market, such as Georgia-Pacific Corp.'s at Port Hudson, La., and Hammermill Papers Group's at Selma, Ala., have been started up with actuators for all three applications.

Donald Brewster, president of Profigard Inc., Montreal, Que., recently reported that "moisture is clearly a pivotal variable. Improvement of the moisture profile makes it easier to control caliper and hence roll condition and surface properties. Moisture profile improvement also provides freedom to level the dry weight profile, which is frequently distorted to compensate for an inherently poor moisture profile." Apparently most of the industry believes in this strategy because CD moisture control applications, at 737, are the most

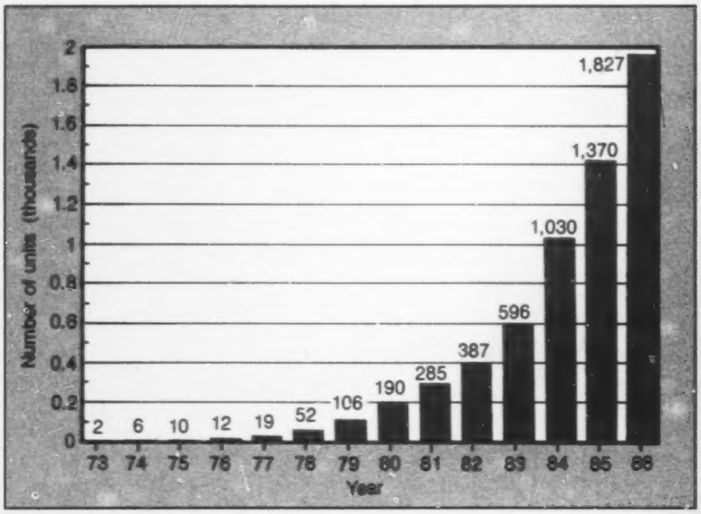


FIGURE 1: **Accumulation of all CD actuators, sold under control.**

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* Please note in Figure 1 that the 960 figure for systems sold through the end of 1984, as reported in the previous survey, has been revised to 1,030.

numerous through the end of 1986, with 201 systems installed in 1986 alone (Figure 3).

CD caliper control—despite being the oldest form—is only the second most common with, 648 total installations through the end of 1986 (Figure 4). Basis weight is the most complex CD control and is also the least common with 462 installations (Figure 2).

VENDORS ENHANCE SYSTEMS. Sentrol, which installed the first CD controls, has had only a minor share of the market recently and reports a total of 70 installations. Sentrol does not supply actuators but instead prefers to work with Devron-Hercules equipment. Since 1986, Sentrol is completely owned by Valmet Automation, which is owned by Valmet Paper Machinery Inc. Wartsila, also a part of this company, has applied CD control to gloss on supercalender installations, and Sentrol will offer this technology.

Early this year Sentrol brought out its new Optiscanner, a scanning sensor platform that it says is designed to improve reliability and serviceability for its sensors. Sentrol has also introduced the Sentry XD paper machine control system, which is said to offer superior software and a high-speed host processor with on-board memory that networks a series of distributed, dedicated single board processors.

Measurex is still the industry leader with a total of 890 CD installations. Measurex added a caliper actuator, the Caltrol, to its product line in 1985 and now provides a complete set of actuators. Approximately 80% of Measurex's CD applications during the past two years utilized its own actuators.

According to the company, the Caltrol provides the largest control range in the industry, with an operating range of 80° to 160° F. The roll wrap is engineered for each application and coupled with a center-exit, high-velocity air impingement design. The Caltrol has reportedly been successfully used to control coat weight pickup on an on-machine coater. Applied to the precoat calender stack, coating pickup at one slice position can be changed by over 2 lb/3,300 ft².

Measurex subsequently became involved in a patent dispute with Impact Systems, which claimed that the Caltrol infringed on the patent for its Therma-Jet caliper actuator, which was introduced in 1984. Measurex claimed that the original idea for the actuator was taken by Impact officers who were formerly employed by Measurex. The dispute was settled with Impact retaining the patent and granting Measurex a nonexclusive, nontransferable license to make the actuators. Measurex, in turn, will provide Impact with guaranteed access to Measurex communication links for use with Impact's actuators at reduced fees.

In 1986, Measurex introduced its Thermatrol II basis weight profiling system. This system utilizes Equilex thermally controlled slice rods from Chleq Frote in France. Control rod stiffness is matched to the slice lip, which reportedly eliminates the need for a slice position feedback system. Cooling air is directed around and through the rods to reduce response time. The Thermatrol II also includes an optional heating element monitor for detecting loss of power.

Measurex's Vision 2002 ET control system, which was introduced in 1986, contains several features designed specifically to improve CD control. Its Autoline is designed to match CD measurement zones with the control zones. According to Profigard's Brewster, "phantom error" profiles due to mismatching measurement profiles to the actuator array often substantially degrade achievable profile uniformity. Measurex's Slice Trak is reported to adjust displayed and controlled profiles for varying degrees ofshrinkage across the web. In the sensor area, the company's Ultrascan reportedly increases the scanning rate across the web to 12 in./sec,

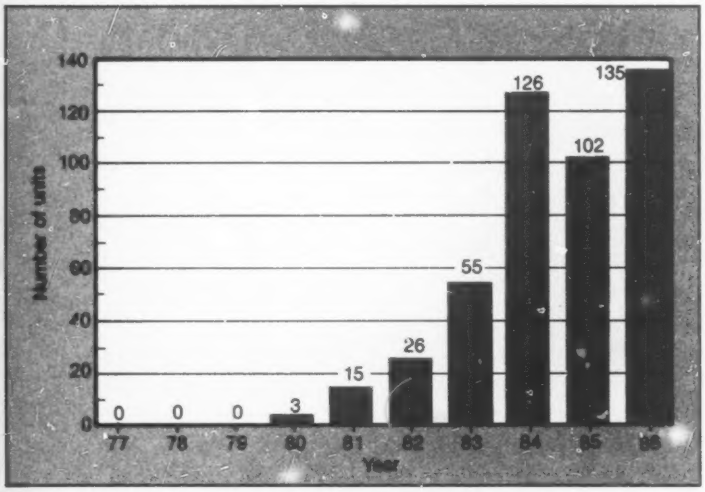
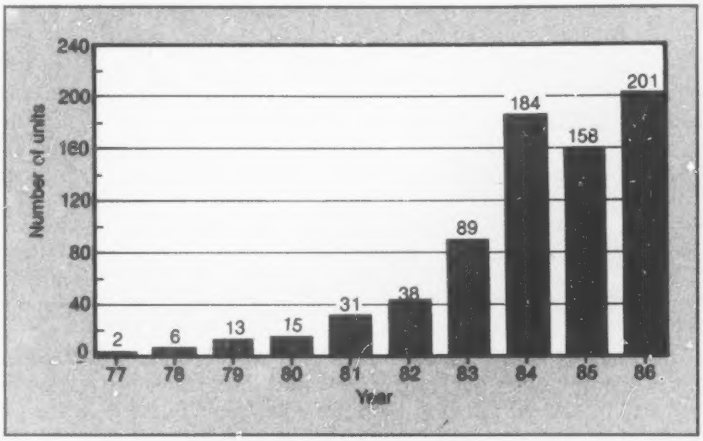


FIGURE 2: **Basis weight CD controls sold.**

FIGURE 3: **Moisture CD controls sold.**



and the Ultratune dynamically separates machine direction variations from the true CD profile. These enhancements are reported to allow determination of the CD profile in one-tenth the time required by conventional scanning systems.

COMPLETE ACTUATOR LINES. AccuRay, which had previously worked with "preferred" actuator suppliers, introduced its family of Microset actuators in 1986. This includes the Linear Stepper Slice Actuator, the Water Spray, and the Thermo-Profiler. AccuRay will also bring out its Microset Steam Profiler in early 1987. AccuRay reported 282 CD applications for the past two years, and is second in number of total installations with 623. Because its line of actuators is relatively new to the industry, only 60% of AccuRay's CD installations in the past two years utilized its own actuators; however, the company expects to see a significant increase in this percentage.

The Linear Stepper Slice Actuator uses pressurized air to achieve rotational movement of harmonic gears within the actuator. This rotational movement is then converted into linear movement of the slice lip. AccuRay holds two patents on this design and claims three times better resolution than other slice actuator types. The Water Spray actuator is water-pressure-atomized with spray modules consisting of four nozzles controlled by four digital stainless steel valves. The Thermo-Profiler caliper actuator utilizes high-temperature, low-volume air flows. Control segments are typically 4 in. in length. The Steam Profiler applies high-velocity steam in three zones, front and back sealing zones and the profiling zone, to the web. The profiling zone is compartmentalized—typically in 6-in. segments—with steam supplied to each zone through a separate actuation valve.

AccuRay was acquired by Combustion Engineering in 1986. C-E reportedly plans to integrate some of its Taylor Instruments operations with AccuRay at Columbus, Ohio. Impact Systems has filed suit against AccuRay and alleges that AccuRay's Thermo-Profiler infringes on the Therma-Jet patent.

NEW MOISTURE SENSOR. Impact Systems, which first introduced the high-intensity infrared CD moisture actuator to the industry in 1981 as its Infra-Pac, now is offering a complete line of actuators with the introduction of its Dyna-Flex CD basis weight control system. The company sold 221 actuators in the last two years. Impact has sold a total of 243 CD control and coating drying systems, of which more than 100 are equipped with "stand-alone" closed-loop control systems that rely on a serial link to the scanning sensor system supplied by another vendor. However, Impact is also entering the sensor business with the introduction of its RT nonscanning moisture sensor.

The Dyna-Flex system is a water-based hydraulic slice lip control system with a reported range of 0 to 0.6 in., backlash compensation, and bumpless transfer both ways on power failure. Impact's RT moisture measurement system consists of a stationary array of sensing elements placed in 3-in. zones across the sheet, which are said to be capable of measuring CD directional data every two seconds.

Early this year, Impact announced a five-year warranty on its Therma-Jet actuator, which it says is the longest available for any caliper control device.

Devron-Hercules, the leading supplier of CD actuators, reports approximately 800 installations in 32 countries. The mainstays of its product line have been the popular Calcoil induction heating caliper profiler and the Devronizer steam box for hot pressing and moisture profiling. Devron developed the thermal-hydraulic type of CD basis weight actuator and has incorporated this principle into its Auto-Slice system. The company also offers Auto-Slice systems with motorized control gears and with pulsed harmonic actuators which utilize a combination of high-ratio harmonic gears coupled to either air or electric motors. Devron recently complemented its line of products with the Hydro-Profiler water pressurized rewetting system for moisture profiling and the Calenderizer steam shower for improving sheet smoothness and gloss profile at the calender stack through the process of hot calendering. Devron-Hercules' research of applications of both the

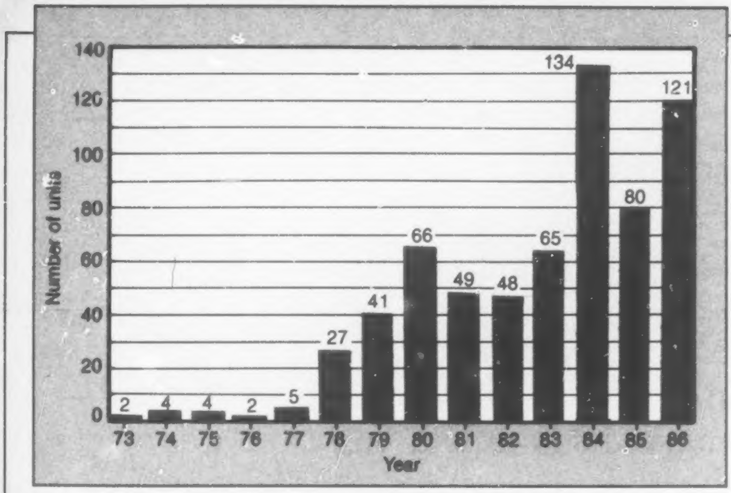


FIGURE 4: **Caliper CD controls sold.**

Calcoil and the Calenderizer on supercalenders has reportedly produced promising results.

Devron-Hercules also entered the infrared moisture profiling market in early 1987, introducing its Infra-Dry electric infrared system for moisture profiling and coating drying. The Infra-Dry is a high-power density drying system using segmented electric infrared modules. The system is designed with 6-in. modules rated at 20 kW mounted side-by-side across the paper machine and with individual power level control for each module. Infrared energy is directed by gold-plated reflectors toward the paper web for high energy efficiency.

V.I.B. Systems Inc. is the leading supplier of rewetting systems for CD moisture control. V.I.B.'s original systems were air atomized water sprays with flow to a single row of nozzles regulated with flowmeters and needle valves. The latest systems are water pressure atomizing, and feature groupings or modules of nozzles with flow regulated by digital valves on or off. Standard nozzle spacing is 6 in.

V.I.B. is one of AccuRay's preferred actuator suppliers and manufactures AccuRay's Microset Water Spray and Steam Profiler systems to AccuRay specifications. V.I.B. has more than 1,200 water spray installations worldwide. A very few of these installations are equipped with stand-alone controls.

EVAPORATIVE COOLING CALIPER CONTROLLER. Three new CD control actuators are being offered by Thermo Electron Web Systems. Its Moisturizing Shower is of 316 stainless steel construction with a 15-step low-voltage control to produce hydraulic atomization. The Steamfoil steam shower features a parallel, counterflow steam application through a nozzle design utilizing the Coanda effect, which has been used in the company's Thermofoil flotation drying systems. Thermo Electron says that the Steamfoil can be applied in the press section and at the calender stack to enhance gloss and smoothness.

The company's newest and most innovative product is its Mystifier caliper profiler. The Mystifier applies evaporative cooling with individually controlled channels on 3-in. centers. The cooling fog produced by the Mystifier is said to be 20 times more powerful than cold air showers and twice as powerful as devices utilizing heat. The Mystifier is mounted 9 in. from a calender roll. The cooling fog is administered by individual banks of nozzles, each controlled by separate stepping motor-driven valves for accurate applications. The unit is reported to require only one-twentieth of the power consumed by cold air shower actuators.

Thermo Electron will supply its T/E NET control system with all its CD actuators. This system utilizes a high-resolution, yellow-on-black electroluminescent control module that permits control of all functions via a touch screen. This system is designed to stand alone or integrate with existing process controls.

Albany International's Engineered Systems Div. will introduce a full-width, online system to measure CD formation based on light intensity variations in early 1987. Formation values from the system, called the Formspec, are said to compare favorably with visual inspections, and the system is claimed to be a breakthrough in measuring this higher level paper quality online. Albany International feels that with this sensor papermakers will close the loop on formation, utilizing formation showers, drainage devices, and other actuators to control CD formation.

THE FUTURE. CD controls are now considered as essential to papermaking as machine-direction computer controls, which is evidenced by their installation on most new paper machines. Most paper machine equipment suppliers offer profiling equipment for retrofits and new machines. Vendors estimate that less than one-half of the CD control and actuator retrofit market is fulfilled. One leading vendor recently surveyed paper machines with its process control systems installed and found an average of 1.9 actuators per machine. With a potential of three to five actuator installations per machine, this obviously leaves a large sales potential. Vendors will compete fiercely for this market, and papermakers should benefit from the innovative new products that will be developed as a result of this competition. ■

WORLDWIDE USE OF ANTHRAQUINONE FOR PULPING CONTINUES TO EXPAND

Since its introduction in 1977, anthraquinone's use as an additive to increase pulp production has spread to more than 70 mills worldwide

By GERALD W. KUTNEY, Ph.D.

On Feb. 1, 1977, C-I-L Inc. presented the results of anthraquinone (AQ) pulping to the public for the first time at the Canadian Pulp & Paper Assn.'s Technical Section's annual meeting in Montreal, Que. The information spread throughout the industry in an unprecedented fashion. Mill trials in North America were carried out within a few months. The spark that this caused is reflected by the number of references to anthraquinones in the *Abstract Bulletin of the Institute of Paper Chemistry* between 1976 and 1981 (Figure 1). By November 1977, Mead Corp.'s Kingsport, Tenn., mill was using AQ on a continuous basis.

Today, more than 70 mills have continuously or intermittently used AQ pulping, and the number of mills that have conducted trials exceeds 100. Japan leads all countries in the adoption of AQ pulping, and at least 18 other countries have AQ mills. The following is a summary of known worldwide use of AQ.

AQ IN AFRICA. The largest pulp company in Africa, Sappi Fine Papers (PTY) Ltd., has carried out trials at its Enstra mill on soda-AQ and NSAQ (neutral sulfite AQ). Sappi has also contemplated adopting NSAQ at its new Ngodwana mill (producing 750 tpd). A mill in Zimbabwe is believed to be using NSAQ. No other mills in Africa are known to use AQ, but mills in Malawi and Tanzania have expressed interest in AQ pulping.

ASIA. Information from this area of the world is scarce. Papers on AQ pulping have been reported from India, People's Rep. China, Taiwan, Korea, and Indonesia. Trials have been carried out by Central Paper Mills and Rohtas Industries Ltd. of India on the kraft-AQ

Dr. Kutney is market research manager-Forest & Industrial Products, C-I-L Inc., Montreal, Que.

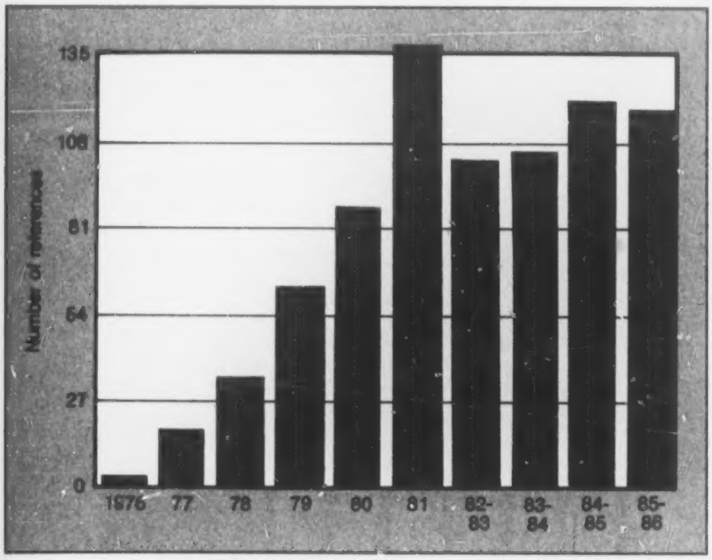


FIGURE 1: **Growth of references in the Abstract Bulletin of IPC (Institute of Paper Chemistry).**

pulping of bamboo. Laboratory studies on AQ pulping have appeared from the Saharanpur mill of Star Paper Mills Ltd., Andhra Pradish Paper Mills Ltd., and West Coast Paper Mills Ltd.

Several AQ mills may exist in People's Rep. China, where AQ apparently is very inexpensive. Soda-AQ pulping is replacing kraft pulping for wheat straws.

Nearly 56% of all pulp produced in Asia is manufactured in Japan. There are 38 reported AQ mills in Japan. The main additive used is DDA (dihydrodihydroxyanthracene), sometimes referred to as SAQ (soluble AQ). Details of DDA pulping at the Kushiro mill of Honshu Paper Co. Ltd. and the Hachinoke mill of Mitsubishi Paper Mills Ltd. have recently been reported.

AUSTRALIA, NEW ZEALAND. A kraft-AQ trial at the N.Z. Forest Products Ltd. mill at Kinleith resulted in a yield gain of 0.6% with addition of 0.02% AQ. Use of 0.1% AQ increased the yield by 1.2%. The use of 0.02% AQ was found to be "economic in most applications and particularly so for a recovery or causticizing limited mill." However, kraft-AQ was not adopted. Trials of NSAQ pulping at Kinleith and Whakatane were more successful, and continuous use resulted. Compared with NSSC, NSAQ reduced cooking times by 50% or cooking temperatures by 41°F. With reduced NSAQ pulping rates, pulp quality was found to be improved. A subsequent report stated that pulp production was increased by 40% at Whakatane, where AQ use has saved $250,000/year. At Kinleith, a high-strength pulp was produced that cannot be made by either the kraft or the NSSC process.

TABLE 1: **Worldwide use of anthraquinone.**

Country	Number of AQ mills		
	Soda-AQ	Kraft-AQ	NSAQ
Argentina	n.a.	1	n.a.
Australia	1	trials	3
Austria	n.a.	trials	n.a.
Belgium	1	n.a.	n.a.
Brazil	n.a.	3	n.a
Canada	trials	1	trials
Chile	n.a.	trials	n.a.
China (PRC)	1+	n.a.	n.a.
Czechoslovakia	n.a.	1+	n.a.
Finland	n.a.	5	1
France	n.a.	1	n.a.
Germany	n.a.	n.a.	n.a
Italy	1	n.a.	n.a.
Japan	1+	35+	7+
India	trials	trials	n.a.
Mexico	1	n.a.	n.a.
New Zealand	n.a.	trials	2
Norway	n.a.	1	n.a.
Portugal	n.a.	trials	n.a.
Romania	n.a.	n.a.	n.a.
South Africa	1	trials	1
Spain	n.a.	3	0
Sweden	n.a.	2	n.a.
U.K.	1	n.a.	n.a.
U.S.	1	4	n.a.
U.S.S.R	n.a.	trials	n.a.
Uruguay	n.a.	1	n.a.
Zimbabwe	n.a.	n.a.	1

Australia Paper Mill's Burnie mill employs a soda-AQ process. The production rate has increased, and now hardwood-softwood mixtures can be pulped instead of just pure hardwoods. Pine alone has been successfully pulped in soda-AQ trials at Burnie. In October 1976, APM examined soda-AQ as a possible substitute for its kraft process at its Maryvale mill. Soda-AQ was not adopted, although it was reported that this pulp was a "satisfactory replacement (1:1) for kraft pulp in bag papers." In 1978 and 1979, soda-AQ semichemical pulping trials were also carried out at the Maryvale mill. The pulp was similar to NSSC pulp. Both Maryvale and its sister mill, Port Huon (240 tpd), have intermittently employed NSAQ since 1978. The Port Huon mill closed in December 1982.

EUROPE. European AQ mills are currently concentrated in Finland and Spain. References to Finland are rare, but it is well documented that United Paper Mill Ltd.'s Tervasaari mill switched from sodium bisulfite to NSAQ in 1981. The mill produces 220 tpd of unbleached reinforcement pulp for newsprint and hypo-bleached pulp for printing grades. The NSAQ pulp can be used to replace high-yield kraft. Juntseno Pulp Co. has contemplated the conversion of one of its kraft mills to NSAQ. Several kraft mills may have adopted the use of AQ in Finland. Nik-Erik Virkola of Helsinki Univ. of Technology has presented the results from kraft-AQ trials taking place in Finland.

In Spain, the state-owned Empresa Nacional de Celulosa S.A. (ENCE) has adopted AQ for its kraft mills. AQ was found to be very effective for pulping eucalyptus. The three kraft mills of ENCE produce a total of 400,000 tpy. Trials have been held by many other major pulp producers in Spain.

The Soviet Union's pulp and paper industry has announced that it has plans to introduce the use of kraft-AQ pulping. At the Arkhangelsk forestry and Kherson complex, soda mills, possibly soda-AQ, have additionally been proposed.

In Sweden, several trials have been carried out (Munksjö AB carried out a kraft-AQ trial in 1979), and at least one mill is believed to be using AQ. In Belgium and the U.K., a soda-AQ process was being used, but these mills subsequently closed. In France, trials have been held, and one AQ mill may exist. Another is also believed to be operating in Italy. Trials have also been reported in Czechoslovakia, Portugal, Austria, and Norway. The trial in Norway was a 20-day trial that examined AQ and THAQ (tyrosine hydroxylase AQ). The process proved to be uneconomical and therefore was not adopted at the 500-tpd Moss mill, the world's oldest operating kraft mill (since 1884). In addition, laboratory studies have been reported from Poland, Germany, Romania, and Bulgaria.

NORTH AMERICA. Mead Corp.'s soda mill at Kingsport, Tenn., has been using AQ since 1977. Addition of 0.06% AQ increased the pulping yield from 44% to 48%. Cooking time has also been reduced. The results of AQ trials on kraft, alkaline sulfite, and neutral sulfite pulping processes have been reported. A few kraft-AQ mills are operating in the U.S., and two further AQ mills may be operational in Mexico.

SOUTH AMERICA. The widespread use of AQ in Brazil has been claimed, especially when applied to the kraft pulping of eucalyptus. In South America, 56% of the continent's total pulp is produced in Brazil. Mills located in Uruguay and Argentina are believed to be using AQ. Kraft-AQ trials have been carried out in Chile, but no full-time adoption of the compound's use is believed to have occurred.

SUMMARY AND CONCLUSIONS. AQ pulping is now an established technology. Japan is believed to be the most advanced country in the world as to the industrialization of quinone additive cooking. Other countries where AQ pulping has become an integrated part of the pulp and paper industry include New Zealand, Australia, Finland, and Spain, among others. More than 70 mills all around the world have adopted this method. The only continent in the world that does not yet have an AQ mill is Antarctica.

This high adoption rate worldwide is extraordinary considering the major recession that the industry went through during the early portion of the 1980s. In North America, the relatively low rate of adoption of AQ can be attributed largely to this factor. The main reason for using AQ is to produce more pulp. During the recession, incremental pulp production was not needed. With the recession ending, however, interest in AQ pulping and its associated increase in pulp production is once again on the rise.

The number of AQ mills is expected to continue to increase around the world, especially in North America. By the year 2000, AQ pulping may become the standard pulping process. Just as kraft pulping displaced soda pulping and became known not as a modification of the soda process but as a distinct pulping technique in its own right, a similar destiny may lie ahead for anthraquinone pulping. ■

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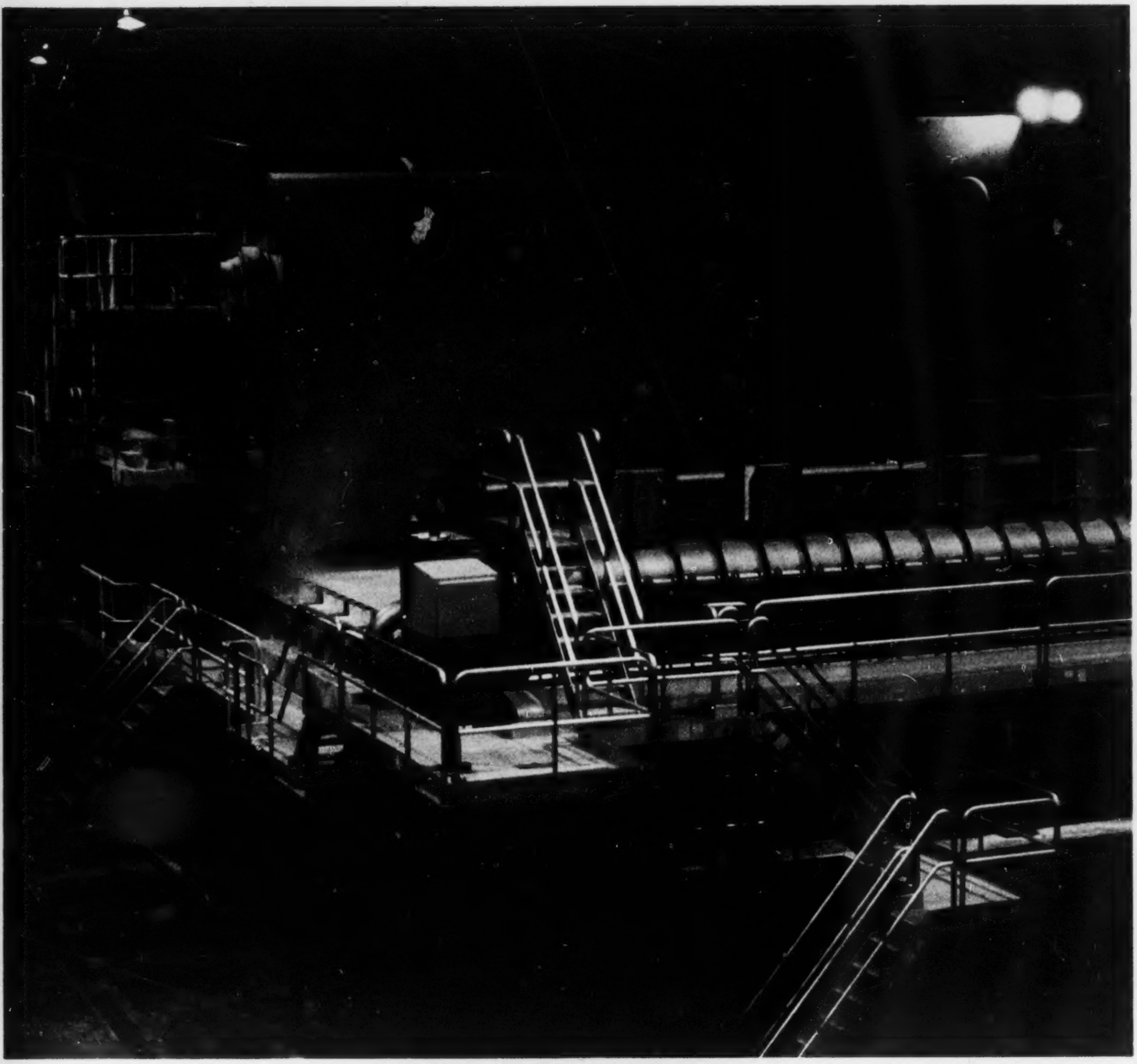

SPECIAL REPORT:

Quality: Putting U.S. paper products to the test

Sponsored by The Dow Chemical Company

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Hammermill starts up uncoated free-sheet machine at Selma **89**

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PULP & PAPER (ISSN 0033-4081) is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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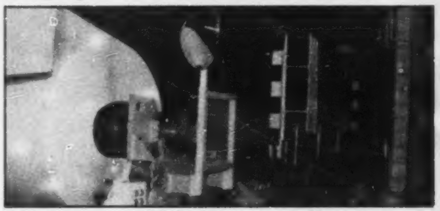

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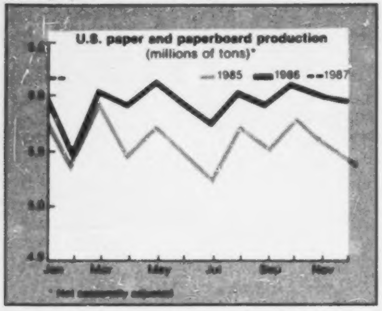
U.S. paper and board production



U.S. production of paper and paperboard climbed to 6.2 million tons in January, up 4.7% compared with January 1986, according to the American Paper Institute. Growth in paperboard production easily outstripped paper, although both sectors remained at record high levels. Paperboard operating rates for 1987 were averaging about 97% through mid-February, the API reports, compared with a 94% rate for paper. The seasonally adjusted trend rate stood at 73.4 million tpy in January, 4.4% above last year. Production was in line with fourth-quarter 1986 results, which got a strong boost in December.

Among major grades, growth trends continued to be strong in newsprint, up 5.9% compared with January 1986, and coated papers, up 8.7%. Production was strong in all of the paperboard grades, led by a 10.4% increase for semichemical board. Corrugated box shipments continued at record highs, although containerboard inventories rose slightly to 5.9 weeks of supply.

Canadian newsprint shipments totaled 750,000 metric tons in January, 5.2% above the comparable 1986 month. Woodpulp exports jumped 8.3% to 610,000 tons, with operating rates climbing to 98%, up from 88% a year earlier. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
***PAPER & PAPERBOARD PRODUCTION*[1]**					
Newsprint	Jan.	490	5.8	5,884	5.9
Uncoated groundwood (s)	Jan.	134	4.7	1,613	3.4
Coated paper (s)	Jan.	566	8.6	6,793	8.7
Uncoated free sheet (s)	Jan.	893	0.4	10,717	0.3
Other printing/writing	Jan.	114	−1.7	1,366	−2.1
Total packaging and other paper (s)	Jan.	446	2.3	5,350	2.2
Tissue	Jan.	412	−3.7	4,938	−5.0
Total paper	**Jan.**	**3,055**	**2.5**	**36,660**	**2.1**
Unbleached kraft paperboard	Jan	1,546	5.8	18,548	5.8
Semichemical medium	Jan.	481	8.6	5,777	10.4
Bleached paperboard	Jan.	381	7.3	4,572	7.4
Recycled paperboard	Jan.	735	7.9	8,822	6.2
Total paperboard	**Jan.**	**3,143**	**6.9**	**37,719**	**6.8**
Total U.S. paper and paperboard output	**Jan.**	**6,198**	**4.7**	**74,379**	**4.4**
***PULP, WASTEPAPER & FIBER*[2]**					
Total U.S. woodpulp production	Dec.	4,901	11.8	57,252	5.7
Market pulp production	Dec.	692	24.9	7,571	11.3
Wastepaper consumption at paper/board mills	Dec.	1,339	10.9	16,579	8.5
Pulpwood consumption (cords)	Dec.	7,795	12.9	91,434	6.6
***CONVERTED PRODUCTS STATISTICS*[3]**					
Corrugated box shipments (billion ft^2)	Jan.	24.708	0.6	24.708[6]	2.6
Containerboard inventories at U.S. box plants and mills	Jan. 1	2,186	−11.7		
***INTERNATIONAL TRADE*[2]**					
U.S. paper imports (including products)	Dec.	833	−6.3	11,597	4.4
Imports of Canadian newsprint	Dec.	578	−12.8	8,269[6]	1.9
U.S. paper exports (including products)	Dec.	446	34.3	4,738	18.2
Exports of unbleached kraft linerboard	Dec.	217	43.7	2,196	21.5
Exports of woodpulp	Dec.	409	38.6	4,458	17.6
Norscan pulp inventories[4]	Jan. 31	992	−25.2		
Norscan pulp operating rates[4]	Jan.	96%	95%	97%	96%
CANADIAN STATISTICS*[5] *(reported in metric tons)					
Total newsprint shipments	Jan.	750	5.2	750[6]	5.2
Operating rates	Jan.	97%	94%	97%	97%
Inventories held by U.S. consumers	Jan. 31	1,319	−6.7		
Other paper/board shipments	Jan.	512	4.9	512	4.7
Woodpulp shipments (export only)	Jan.	610	8.3	610	8.3
Operating rates	Jan.	98%	88%	98%	88%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

UNCOATED FREE-SHEET: Price recovery falters

Grade structure: Uncoated free-sheet papers contain no more than 10% mechanical pulp, with the balance being chemical woodpulp. Excluded are uncoated groundwood, cotton fiber, bristols, and thin papers. Major end uses include office papers (bond, forms bond, xerographic, tablet, and envelope), printing papers (offset, cover, and text), and miscellaneous (such as technical, papeterie, or colored school).

Production/capacity: The use of uncoated free-sheet grades continued to grow in 1986, as in the two previous years. Demand was led by office copy paper, commercial printing, and book printing papers.

Shipments rose 7.7% in 1986 from 1985. Capacity rose 4.2% in 1986 from 1985, and it is expected to increase by the same amount in 1987, according to the American Paper Institute. New machines were brought online in 1986 by Georgia-Pacific Corp. in Port Hudson, La., 230,000 tpy; and Hammermill Paper Co. in Selma, Ala., 185,000 tons. Machine rebuilds and speedups added about another 63,000 tons in 1986. At the end of the year, Champion International Corp. completed the conversion of its No. 5 Stress Kraft machine in Pensacola, Fla., to 260,000 tpy of uncoated free-sheet. In addition, Boise Cascade Corp. added 35,000 to 40,000 tpy at Wallula, Wash., by adding dryer capacity to the 110,000-tpy No. 3 machine.

Domtar Inc. is planning two new machines in Windsor, Que., that will add 228,000 metric tpy by 1990, with production partly targeted at the U.S. market. Great Northern Nekoosa Corp. may add 326,000 tpy if the company follows a proposed five-year plan at three U.S. mills for machine rebuilds and possibly a new machine. Union Camp Corp. reportedly is considering a second machine for its Eastover, S.C., mill.

Outlook: Uncoated free-sheet operating rates are expected to drop slightly from 95.5% posted in 1986 to a 93% to 94% range in 1987. Strong demand growth in 1986 in part represented inventory building and came on the heels of a terrible 1985. Shipments will increase about 4% to 5.4% growth in 1987 from 1986, about double the 1987 GNP growth rate of 2.4% predicted in Blue Chip Economic Indicators.

Imports declined in 1985, but went up substantially in 1986 and should continue on a smaller rise in 1987. Prices will average 5% to 7% higher in 1987 than in 1986 if increases hold.

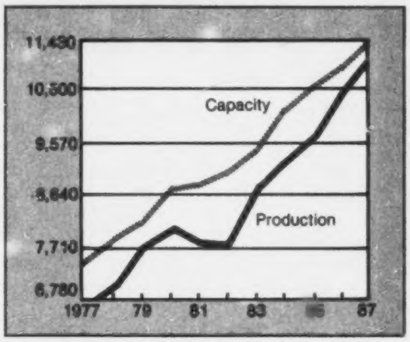
Pricing: Offset, office, and book papers all climbed in price during 1986 to near or at the levels in 1984, though some price hikes scheduled for January 1987 were partly rescinded in February. Forms bond was the first to post a major hike, with $30/ton going into effect in February. That was followed in the second quarter with increases for book papers and offset, then offset again in the last quarter. But additional capacity from Champion's Pensacola, Fla., mill was expected to help ease a tight market, and merchants reported comfortable discounting of at least 10% on the announced prices for offset. The hikes also were being undercut by producers that refused to go along.

Text and cover grades also faced trouble on the new prices, although some special cut-size papers rose $40/ton in February. Increased demand for uncoated free-sheet in 1986 may hurt demand and sales in 1987 as buyers pull back from their large orders and reduce inventories, industry sources said.

Price trends for two important grades are (year-end, $/short ton), book paper, No. 3 offset, 45-lb sheets: 1980, $785 to $813; 1981, $878; 1982, $680; 1983, $840; 1984, $880; 1985, $800; 1986, $850. Forms bond, 15-lb rolls: 1980, $643 to $697; 1981, $753; 1982, $640; 1983, $745; 1984, $680; 1985, $600; 1986, $620 to $720.

Markets: bond, mimeo, duplicating, xerographic—24.4%; forms bond—21.2%; offset printing—25.6%; envelope—8.6%; tablet—4.1%; carbonless—5.3%; other—10.8%. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1985	1986	1987e
Production[1]	9,750	10,504	10,673
Capacity[2]	10,515[3]	10,955[3]	11,416
Utilization rate	92.7%	95.9%	93.5%
Imports	365	452[1]	371
Exports	65	49[1]	59
Apparent U.S. consumption	10,050	10,907	11,383
lb/capita	83.93	90.26	93.65
GNP ratio	5.60	5.93	6.04

e = Estimate

1. *P & P* estimate.
2. American Paper Institute data.
3. Revised

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Int'l. Paper[1]	1,700	14.9
2. Champion Int'l.	1,086	9.5
3. James River[2]	834	7.3
4. Great Northern	830	7.3
5. Boise Cascade	819	7.2
6. Georgia-Pacific	798	7.0
7. Union Camp	725	6.4
8. Weyerhaeuser	580	5.0
9. Mead	435	3.8
10. P.H. Glatfelter	342	3.0

Market share of top five companies:
46.2

Market share of top ten companies:
71.5

Total U.S. capacity (1987):
11.4 million short tons

1. Includes Hammermill
2. Includes Crown Zellerbach

The decision to begin with Abitibi and CIP was prompted by the logistics involved in arranging the meetings, Buchanan said, and not an indication that either company would be "instrumental in setting a pattern" for negotiation efforts. When the preliminary exchanges are complete, representatives from the union locals will aid in approving the final agendas. Formal presentations to each company were expected to take place at the end of March.

Wage increase demands, outlined during the union's Wage Policy Conference in January (*P&P*, Mar. 1987, p. 31), will be an essential part of each presentation. The union is asking for increases of 14.8% over the life of the new contract. Also, the union is still "very concerned" about job security provisions, according to Buchanan.

Pensions will be combined with other negotiations, rather than being covered by a separate settlement, as in the past. The most agreement covering pensions, negotiated with Abitibi in 1982, expired last fall. Pending federal legislation would institute country-wide pension reforms and could affect bargaining this year, said Buchanan. ■

EQUIPMENT

Harnischfeger rejects a $356-million buyout bid

Harnischfeger Industries Inc., which itself recently purchased Beloit Corp., rejected a $365-million tender offer for control of the company by a group of private investors. The board of Harnischfeger, based in Milwaukee, Wis., said it had no interest in pursuing the proposal. The group, led by Columbia Ventures Inc. of Miami, Fla, offered $19/share for outstanding Harnischfeger stock. Columbia already owns 7.3% of the firm's shares.

In response to the Harnischfeger rebuff, Columbia's chairman, Laurans A. Mendelson, said the investor group was studying the situation. He added that the group's position remains as stated in its filing with the Securities & Exchange Commission, which said that if the proposal was turned down, the investor group planned to "continue to explore the feasibility of, and strategies for, seeking control."

Under conditions of the original offer, current managers and plans of management would be retained. ■

SALES & EARNINGS

Canadian earnings swelled 77.7% in 1986

Healthy market pulp sales were largely responsible for the strong earnings performance by Canadian pulp and paper companies in 1986. Earnings for the full year rose by 77.7%, while sales were up 7.5%. It would have been an even better year if companies in British Columbia had not been hamstrung by the five-month-long strike by members of the International Woodworkers of America union.

As was true in the U.S., Canada's weak currency helped increase exports, particularly of market pulp. In the second half, newsprint producers reaped the benefits of their first viable price hike since April 1985, and producers are looking to implement another hike on Apr. 1 in Canada.

As Adam Zimmerman, chairman of MacMillan Bloedel Ltd., put it, "currently, the pulp and paper markets are darned good, and given stable conditions, you're going to see handsome results from them this year." Two clouds on the horizon are upcoming labor talks in eastern Canada and uncertainty in Canadian lumber markets due to the 15% export tax on softwood lumber sold to the U.S.

Tops in total sales. Abitibi-Price Inc., Canada's leader in newsprint, enjoyed a 7.1% increase in earnings on an 8.4% improvement in sales. Bernd K. Koken, president and CEO, noted that the "positive results of cost reductions, upgraded product mix, and productivity improvements were largely offset during 1986 by the negative effect on margins resulting from highly competitive markets for Abitibi's products." He predicted, however, that firming newsprint markets will continue through 1987.

MB reported sales of C$2.5 billion with a 210% increase in earnings. Third-highest with regard to total sales was Domtar Inc., which reported a 31.3% increase in earnings on an increase of 5.0% in sales.

Consolidated-Bathurst Inc. broke the C$2-billion mark in annual sales for the first time. Earnings would have been considerably above 1985 levels except for a C$54.2-million writeoff of oil and gas investments incurred in the first quarter. Con-Bath attributed the increased earnings to "improved prices in newsprint, market pulp, and linerboard, higher oper-

Canadian paper/forest products industry third-quarter results.

	Full year 1986 (C$000)			
Companies	Sales	Change 1986/85	Earnings[1]	Change 1986/85
Abitibi-Price	$2,763,500	8.4%	$107,300	7.1%
BCFP	1,100,000	−3.5	40,200	33.6
Canfor	1,046,800	−3.4	32,000[2]	152.1
Cascades Inc.	440,130	65.3	33,777[2]	73.7
Consolidated-Bathurst	2,018,000	16.9	48,400[2]	−36.3
Crown Forest Industries	864,200	1.3	38,300[2]	130.7
Domtar	2,330,000	5.0	146,000[2]	31.3
Donohue	475,600	12.0	24,500	17.2
Great Lakes	637,531	7.7	30,049	746.5
MacMillan Bloedel	2,511,700	7.5	133,300[2]	210.7
Rolland	344,700	14.8	7,363	20.0
Scott Paper Ltd.	281,854	6.1	12,929	15.8
Weldwood	658,946	4.8	30,037	306.8
Total	$15,472,961	7.5%	$684,155	77.7%

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Canfor:** Year net excludes C$8.3-million writedown on shares in Versatile Corp. **Cascades:** 1986 earnings exclude C$10.226-million gain from tax credits and profit from subsidiary's stock issue. 1985 net earnings include C$5.294-million gain. **Consolidated-Bathurst:** Year net includes pretax charge of C$54.2 million related to writeoff of oil and gas investments. **Crown Forest:** Year includes a net loss of C$12.3 million due to combined effect of sales of Crown Stores Ltd. and loss incurred from debt restructuring. **Domtar:** Year net includes $10.1-million gain from prior years' tax losses in the U.S. 1985 includes a $14.3-million tax credit. **MacMillan Bloedel:** Year excludes C$45-million gain from sale of part interest in Koninklijke Nederlandse Papierfabrieken, Netherlands.

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QUALITY

Standards in the manufacture of U.S. paper, board, and pulp
Section I: From the converter's perspective

By KEN L. PATRICK, Editor, KENNETH E. SMITH, Executive Editor, and MICHAEL J. DUCEY, Technical Editor

Quality standards in the U.S. pulp and paper industry may be somewhat of a misnomer. Although most mills generally have some online, computerized control of their processes and utilize standardized laboratory tests to monitor and maintain quality, they do not always manufacture the same competitive products.

From the perspective of an independent box plant, linerboard quality can vary widely from mill to mill. Overall, the printability of newsprint from a twin- wire machine may be superior to that produced on a plain fourdrinier, but other factors like basis weight and tensile strength affect press operations and could equally important to a large daily newspaper. While some mills can fill many of their customer's needs, few, if any, are able to consistently meet all of them.

This situation is not uncommon in most U.S. manufacturing industries, except in closely regulated fields, such as medical/pharmaceutical supplies and other areas involving consumer health and safety. However, in the paper industry, mill-to-mill variations in product quality do not reflect a lack of emphasis on quality control. In fact, recent process improvements and intense quality control programs implemented by several companies have dramatically boosted the end-use value of U.S.-produced paper and board.

In this special report *Pulp & Paper* takes an in-depth look at how paper mills are currently maintaining the quality of their products. The analysis begins with a series of independent converter company interviews to determine, from a customer point of view, the actual performance of paper and board grades manufactured in the U.S. Focusing on product criteria most important to these major end-users, and why, this section also examines various quality related paper and board problems encountered in the converting processes and explores how they might be solved.

Complementing these interviews is input from several major printing houses and large daily newspapers in the U.S. Together, information from these vital customer sectors sets the stage for Section II, which is a detailed, grade-by-grade survey of the paper industry itself--to determine specifically what is being done in regard to quality assurance.

Primarily, the second section of this report investigates current online and offline quality monitoring, control, and testing procedures at individual mills. A review of available and in-use equipment is also included. By combining and summarizing data, this section creates a detailed picture of the U.S. industry's effort in this most important aspect of production. By design, it reflects the strengths and weaknesses of a "system" which has evolved according to changing market conditions, end-user requirements, and developing technology.

The third section examines new approaches to quality control that have been implemented only in the past year or so. One such method, statistical quality control (SQC), is studied from the perspective of several vanguard mills that have significantly reduced process and finished product variations with programs customized to their operations. As discussed in this report, many of these mills are now requiring their raw material suppliers to initiate SQC programs of their own.

A glossary of major tests and testing terminology follows this final

Photograph by Rod Reilly

Measuring moisture profile across paper machine width at Georgia-Pacific's Port Hudson, La., paper mill.

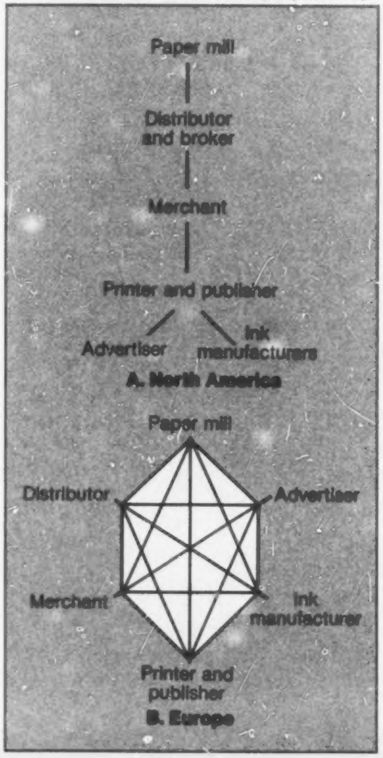
section. It is not intended to be a complete dictionary of laboratory test procedures and equipment and is included only to familiarize readers with terms related to the text of this report.

U.S. VS EUROPEAN TRENDS. Due to a combination of resource and weak currency advantages, the U.S. paper and paperboard industry was able to firm up its position as low-cost commodity producer in the world marketplace during the 1970s. However, some industry analysts feel that this financially successful emphasis on cost-minimizing, together with a trend toward forward integration into converting by the paper and board producers, has detrimentally affected converted product development in recent years, placing U.S. companies, both independent converters and paper companies with integrated converting operations, in a competitively weak position compared with their western European counterparts.

In an interview with *Pulp & Paper*, and an article published in *Tappi Journal* (Oct. 1986, p. 39), Peter Woodbridge, vice president of marketing and sales, Woodbridge, Reed & Associates, a division of H.A. Simons (International) Ltd., pointed out that as paper and board products have become higher valued and more sophisticated in the 1980s and product life has shortened, commodity growth has slowed significantly. At the same time, the quality and performance of those products have become increasingly important. In the European arena where less emphasis has been placed on minimizing costs, converters have been able to develop improved products and gain a competitive edge over American converters.

Tissue and absorbent products, according to Woodbridge, may be the only converting sector where the U.S. still maintains world leadership. This he attributes to the direct contact and rapport U.S. companies continue to have mith these markets and to the fact that tissue producers have effectively controlled the converting end, including even the design and development of equipment used in the converting operations. In this highly competitive area, the interest and involvement maintained by the tissue and nonwovens manufacturers in converting operations have kept cost-minimizing pressures somewhat in check.

FIGURE 1: **Comparison of relationships between printing paper producers and converting segments in the U.S. (top) versus those in western Europe (bottom).**



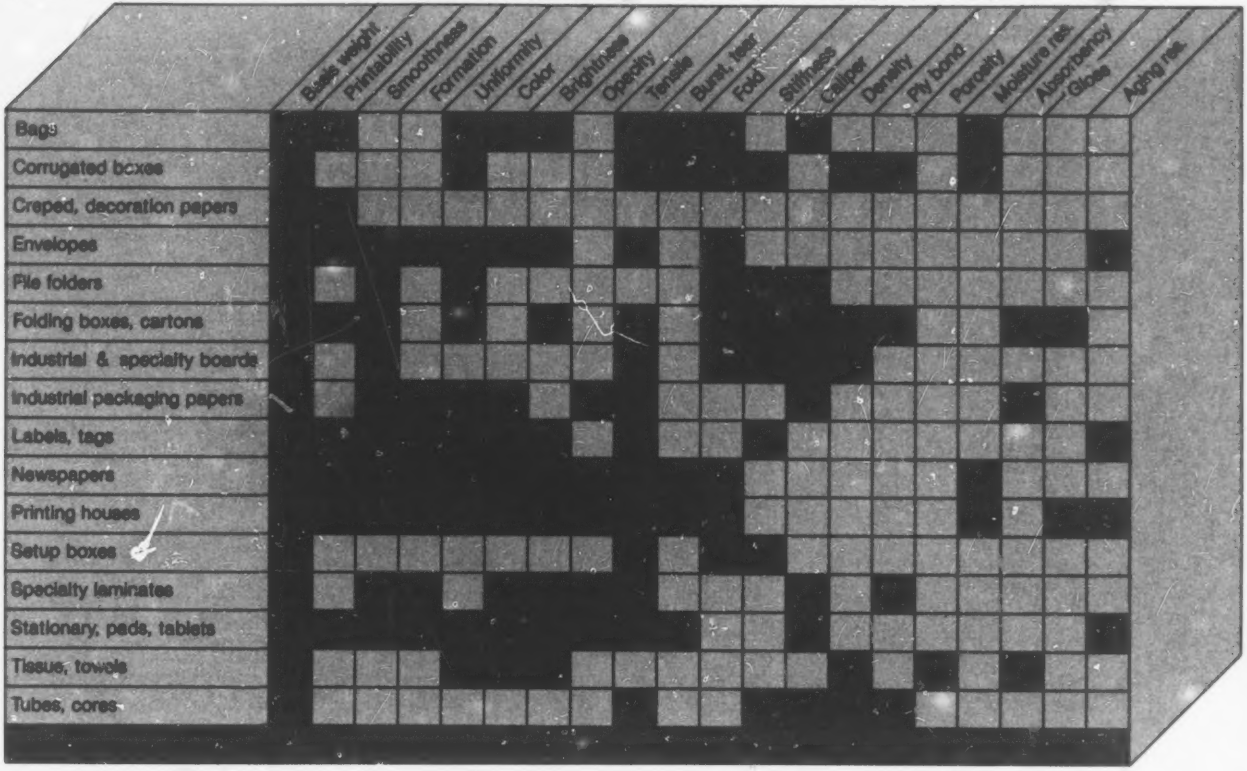
But in the paper and paperboard sectors, the U.S. has clearly relinquished its leadership role, "primarily due to a lack of converting innovation and the converter's shift away from being market-oriented toward being cost-oriented," Woodbridge emphasized. "In the 1950s and 1960s, paperboard and packaging converters in the U.S. were the most innovative in the world. But the forward integration of paperboard producers, who were much more conscious of cost-minimizing than were independent converters, has resulted in a distinct trend away from product development."

As the U.S. dollar strengthened in the mid-1980s, the American companies position as low-cost commodity producers was suddenly eroded. In the wake, insufficient time and money had been spent on R&D to develop converted products competitive with those being produced in western Europe. As a result, considerable converting technology is now being imported into the U.S.

The overall quality of printing papers produced in western Europe is generally superior to that of U.S. papers, according to Woodbridge, which, together with a shift in currency values, helps explain the increased importation of these European grades into the U.S. To a large degree, this superiority is because European producers "have much better contact with printers, publishers, machinery producers, ink suppliers, and advertisers—the industries that directly affect conversion," he explained. This close relationship between the producer and converter "leads to a more market-oriented business approach."

Figure 1 compares the relationships between printing paper producers and various converting elements in the U.S. with those in western Europe. Woodbridge pointed out that European converters are treated more as "peers" or even partners in some respects, whereas

TABLE 1: **P&P survey results of paper and board characteristics considered most important by a group of independent converters.**



	Basis weight	Printability	Smoothness	Formation	Uniformity	Color	Brightness	Opacity	Tensile	Burst, tear	Fold	Stiffness	Caliper	Density	Ply bond	Porosity	Moisture res.	Absorbency	Gloss	Aging res.
Bags	●	●			●	●	●		●	●	●		●				●			
Corrugated boxes	●				●				●	●	●	●		●	●		●			
Creped, decoration papers	●	●																		
Envelopes	●	●	●	●	●	●	●		●		●									●
File folders	●		●		●						●	●	●							
Folding boxes, cartons	●	●	●		●		●		●		●	●	●	●	●			●	●	
Industrial & specialty boards	●		●						●		●	●	●	●						
Industrial packaging papers	●		●	●	●	●		●	●				●					●		
Labels, tags	●	●	●	●	●	●	●		●			●								●
Newspapers	●	●	●	●	●	●	●	●	●	●	●						●			
Printing houses	●	●	●	●	●	●	●	●	●	●	●						●		●	●
Setup boxes	●								●		●	●								
Specialty laminates	●		●	●		●	●	●	●				●		●					
Stationary, pads, tablets	●	●	●	●	●	●	●	●	●	●			●							●
Tissue, towels	●				●	●	●							●		●		●		
Tubes, cores	●								●			●	●	●	●					

in the U.S., the relationship is very linear and rigid, subordinating the converter in certain respects. As depicted in the figure, the complex, sophisticated European network is more conducive to market feedback, allowing interaction in many directions resulting in improved product innovation and performance. In the U.S., the linear setup is "designed basically to sell commodities."

Although Figure 1 refers to printing papers, it conceptually applies to all paper and paperboard sectors. The "pendulum," in Woodbridge's view, "has swung and many U.S. pulp and paper companies are now paying for a lack of foresight." It should be noted that the value of the U.S. dollar has declined significantly against foreign currencies in recent months, but whether or not the pendulum may swing again is, at this time, still a matter of speculation.

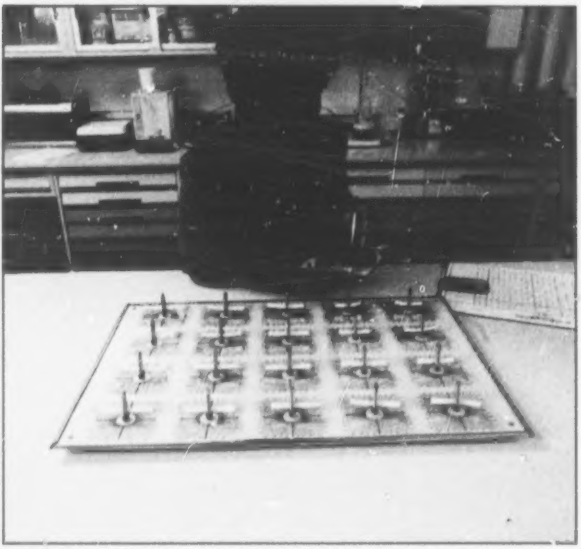
The following section, based on a *Pulp & Paper* survey of 50 independent paper and board converter companies in the U.S., examines quality criteria most important for a cross-section of products and operations. It explores the needs and opinions of these converters in relation to product development and manufacturing technology in the U.S. It examines what could be done to produce higher valued products that will be more competitive in the world market. Concerns about pricing, relations with paper mills, producer/converter feedback, etc., are also examined.

QUALITY CRITERIA. Table 1 contains paper and board characteristics considered most important by independent converters responding to the survey. Company products are listed by the converters, and only those paper and board characteristics specifically cited are included.

This table summarizes and combines data, i.e., not every manufacturer of a certain product chose the same characteristics, but every company's response is included. Thus, the table may not represent a consensus of opinion. Not all newspapers, for example, thought that folding endurance was important, but at least one did. Likewise, only a few label and tag converters listed aging resistance as important. Not all converters felt that basis weight was important but at least one converter for each product listed it.

Most comments regarding converter quality criteria came from newspapers and printing houses. Richmond Newspapers, for instance, reported that factors affecting runability are the major considerations given newsprint they buy, adding that "this is necessary due to the converted offset printing process we use. The introduction of water and fountain solution to printing requires a strong sheet that can withstand the moisture. The converted press exposes the newsprint web to more moisture than the conventional offset, creating additional moisture requirements.

"The water drop test is necessary for us to determine adequate moisture resistance. It is done by placing a measured drop of distilled water onto a suspended newsprint sample and with a stopwatch, timing the drop until complete absorption," a Richmond spokesman said.


Photograph by Jim Robinson

Testing paper curl at G-P's, Port Hudson, La., paper mill.

In Minnesota, a large web offset printing facility divided important printing paper characteristics into these two categories— printability and runability. The quality control person at this plant explained "at this point, I don't believe it is known what characteristics of paper are the most important as far as printability is concerned. In the past many tests have been performed by paper mills to help produce a better product. But the ultimate test is the web test.

"The problem for paper mills has been to get quantifiable feedback from the printer as to how the paper prints. In this respect, our facility is now able to provide excellent feedback from print quality numbers we are collecting from our printing presses. Currently, we are conducting our own tests for smoothness, brightness, moisture resistance, surface formation, color, gloss, etc. And we share this information along with print quality data with our paper suppliers on a monthly basis. We hope this data will help the mills make a better product.

"Another advantage of collecting print quality data is to be able to change or adjust press variables according to the type of stock. Printability characteristics are more critical to the final product than the runability characteristics, but neither can be forgotten.

"Runability characteristics such as strength, stiffness, creaseability, stretch, burst, tear, and fold determine if a web will run on a press without breaking and produce a good folded product. Some characteristics may not affect runability or printability, such as opacity and color. However, the customers usually choose the color they like or the amount of show-through they will accept. Many customers have elected to run a lower basis weight stock due to costs rather than quality. We feel that we have to know how to adjust to print well on all kinds of stock," he explained.

Hart Press, another large Minnesota printing house, specified that the coated groundwood papers it uses must have good roll quality and minimum mill splices, adding that it records web breaks per 100 rolls on all of its stocks. Quality and shade must be consistent from run to run and month to month because Hart's customers demand extremely high consistency. Coating must be of the highest quality—no scale, streaks, uneven gloss, mottling, etc.

Cox Enterprises, publishers of the *Atlanta Journal* and *Atlanta Constitution*, stated that their most important characteristics today are opacity and printability, although brightness and/or color are becoming important and will increase in importance in the years ahead. The *Dallas Morning News* also listed runability factors as being extremely important, along with brightness, basis weight, opacity, and smoothness.

QUALITY PROBLEMS. Figure 2 shows responses to questions on overall quality of shipments received by converters, off-spec shipments, and pricing. Response levels vary for these questions because some companies did not answer all of them.

Of particular interest, about three times as many converters said that they regularly received sufficient quality paper and board than those who said they did not. When the "sometimes" responses are considered with the "yes" responses, the independent converters give producers very high marks on the general quality of paper and paperboard they buy.

Although responses were favorable on the quality question, the comments were somewhat mixed. Zimmer Paper Products, an Indianapolis, Ind., based converter of food and confectionary packaging, and release-coated papers for industrial applications and laminated pressure sensitive basestock for labels, said that although quality from U.S. producers is generally sufficient, "domestic papers are much in need of improvement. Formation of European sheets is much better than that of U.S. grades, and this provides superiority in all of the other characteristics." Zimmer mainly buys paperstocks from midwestern mills and Europe.

San Joaquin Packaging Corp. of Stockton, Calif., buys some 850 tons of board per month for conversion into folding cartons. Most of the recycled board, bought from local mills in California, reportedly has too much moisture and other variations, and the printing surface is "inferior." Solid bleached sulfate SBS board from Idaho and Georgia mills is "adequate." Cindus Corp., a Cincinnati, Ohio, creped paper manufacturer for decorations, insulation, and industrial wrapping, said that electrical grade kraft (northeastern mills) and tissue (midwestern mills) are adequate. However,the 4,000 to 5,000 tpy of kraft purchased from southern mills is not. "What we get instead of converting kraft is modified multi-wall sack grade. It is dirty, has bad formation, and is inconsistent," the company explained.

Plymouth Inc., Bellmawr, N.J., a tablet, pad, and envelope manufacturer purchases "sufficient quality" stocks directly from P.H. Glatfelter Co., International Paper Co., and Georgia-Pacific Corp. mills. "However, in the past, when we bought from paper merchants (especially envelope papers), we had some difficulties. The paper would jam up in the machinery regularly. But we always buy our tag stock from merchants and we seldom have any problems," a Plymouth spokesman added. Princeton Packaging, a Vernon, Calif., grocery bag converter reported that it did not receive sufficient quality stock, explaining that "consistency between and within mills (on the West Coast) is not satisfactory."

The Columbia Corp., Chatham, N.Y., manufactures a laminated specialty board (displays, jigsaw puzzles, book covers, etc.). Board bought from mills in New York and paper from mills in the Northeast and Midwest have "yes" and "no" quality. Uniformity of shade in colored papers from run to run is sometimes a problem. At times, appearance is a problem because of specks, slime spots, and holes or undefibered stock in a portion of a run. Crowell Corp., Newport, Del., reported that the kraft paper it buys from mills throughout the U.S. to make sealing tapes and other specialty products generally has some uniformity problems with the heavyweight grades. Constant splicing problems are also experienced when coating the sheet.

Fortifiber Corp., Attleboro, Mass., manufactures wide laminated and coated products for industrial uses. Stocks bought from various regions of the country include southern and western converting kraft and southern kraft linerboard. A plant spokesman reported that "in general, the natural converting kraft is not of sufficient quality because of severe bagginess on wide-width (up to 100 in.) rolls." John T. Raisin Corp., a foil and metalized paperboard converter in South San Francisco, Calif., is not satisfied with the quality of board it purchases because of a consistently "rough surface."

OFF-SPEC SHIPMENTS. The majority of converters are satisfied with the overall quality of paper and board products they buy, however, an overwhelming number reported regular receipts of off-spec shipments, as is shown in the middle graph of Figure 2. Obviously, most converters consider out-of-specification problems separate from general quality problems. Most would classify these as abnormal, one-of-a-kind defects or orders not as they specified, but otherwise of apparently acceptable quality.

Some converters purposely buy off-spec paper and board, such as Damsky Paper Co. of Birmingham, Ala. (industrial papers), and Paxton Paper Co. of Harrisburg, Pa. (file folders). "We specialize in buying and selling off-spec merchandise," Damsky stated, and according to Paxton, "we actively pursue job lot markets." John T. Raisin Corp. said "we do receive and try to use off-spec board."

For most converters, however, off-spec shipments cause serious

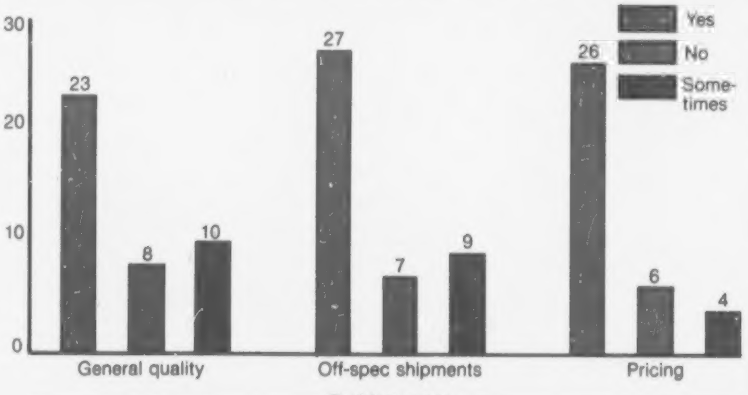
TABLE 2: **Top 10 recommendations to U.S. paper mills from surveyed converters.**

Converter Suggestions

1. Improve overall consistency
2. Increase quality control efforts
3. Make basis weights more accurate, uniform
4. Improve printability
5. Enhance smoothness and general surface formation
6. Cut slitting/rewinding defects
7. Bleach to a more uniform brightness
8. Control moisture, caliper, coating variations
9. Reduce pin holes, shives, wrinkles
10. Provide more technical help

Q: As far as your converted products are concerned, what could paper mills do to make better paper or board?

FIGURE 2: **Response of surveyed converters to questions on quality and pricing.**



Q:
1. Are the paper and board you are now buying of sufficient quality?
2. Do you ever receive "off-spec" shipments?
3. In pricing, are you unfairly treated?

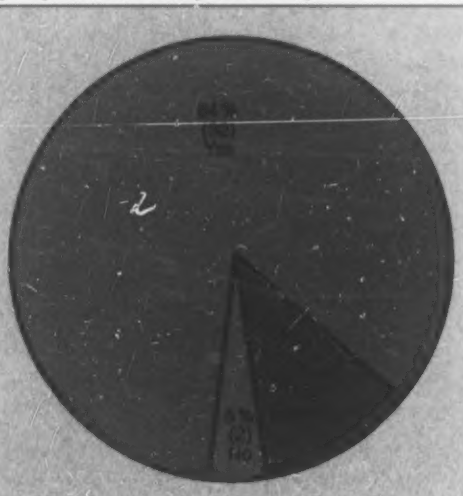
problems. According to Colombia Corp., "we try to avoid them by requesting out-turn samples, but these do not always represent the whole run. When we do run into off-spec paper, not only do we lose product, but we also experience downtime since we then must pull another roll from stock."

Zimmer Paper Products reported that they did receive off-spec shipments "but not as frequently as in the past, thanks to our vendor certification program. Advance out-turn samples and mill run data head off some potential off-spec shipments. We try to find a home for off-spec materials that slip through, in order to minimize economic loss to the supplier, but this becomes more difficult as our customers' quality demands are constantly increasing."

Waldorf Corp., a St. Paul, Minn., folding carton converter, stated that "with off-spec shipments we do receive from time to time (quality specs off of what was specified), major problems generally involve delamination, caliper, and weight." Waldorf buys 68,000 tpy of SBS and solid unbleached sulfate SUS paperboard from a variety of southern mills and uses about 80,000 tpy of recycled board, a large portion of which Waldorf produces.

Universal Folding Box Co., Hoboken, N.J., also reports delamination problems with some of its receipts, as well as sheet waviness or curl, and flaking of the coating. Converting Specialties, a Dayton, Ohio, board and paper sheeting operation, uses stocks (International Paper Co., Manville Corp., Westvaco Corp., and Miami Paper Corp.) purchased and shipped to its plant by customers. "We do receive off-spec shipments which causes us too much downtime. This happens infrequently, and when it is brought to the supplier mill's attention, the roll is quickly replaced or credited to our customers," a representative pointed out.

FIGURE 3: **Level of converter/paper company communications (survey responses shown in parentheses).**



Q: Do you regularly communicate with paper companies from which you buy paper or board (to discuss quality problems, complaints, etc.)?

Wrinkles and holes are also a persistent problem, as reported by Fortifiber and Chase Bag Co. (multiwall and consumer) of Sibley, Iowa. Fortifiber added that "we find this to be at too high a frequency in natural kraft and linerboard, resulting in increased waste in the converting operation." Orchard Corp., St. Louis, Mo., tries to use off-spec shipments whenever possible in its roto-gravure printing operation for industrial end-use products, but it does "warn suppliers to correct specs." Sanitor Mfg. Co., Kalamazoo, Mich., always "sends back" the off-spec toweling or tissue it receives.

The converting division of Unijax Inc., in Jacksonville, Fla., manufactures precision sheeting, file folders, add roll, and envelopes (stock purchased from Union Camp Corp., International Paper Co., Georgia-Pacific Corp., and Gilman Paper Co.). The plant stated, "we have challanged one mill for running consistently over nominal basis weight, representing an effective, significant price increase. We do not accept a response that rolls are 'within tolerance.' We demand the entire mill cross-section be at nominal."

Richmond Newspapers explained that it attempts to use off-spec material after lodging a quality protest with the vendor, adding that "it usually involves the water resistance of the sheet. However, recently the regularity of this problem has diminished. It causes additional running breaks that otherwise would not have occurred. This leads to reduced production and a greater amount of waste."

A Midwest printing house pointed out that it does not discover off-spec paper until it is on the press or after press. "Pretesting paper means opening rolls to cut out a sample. This is a time-consuming and wasteful process. In order to do our paper testing, we sample the stock left on the core after it is taken off of press. Runability problems are recorded on press and fed back to the paper mill. If rolls are found to be substandard while running on press, they are taken off and set aside to be returned to the mill or scrapped," a spokeman emphasized.

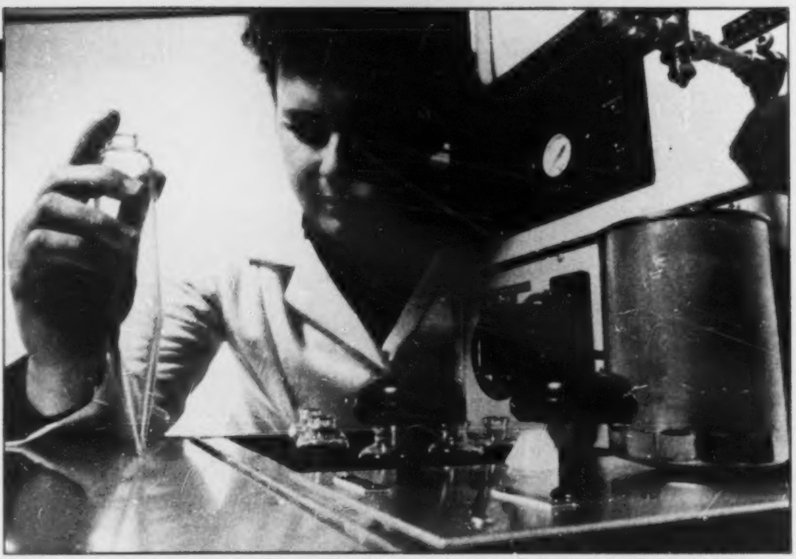
PRICING CONCERNS. The pricing graph in Figure 2 shows that many converters continue to be concerned about the subject of pricing. Even though not directly related to quality, pricing obviously has an effect on a converter's end product. If necessary, some of the quality may have to be sacrificed when prices escalate, to maintain a certain level of profitability.

Comments generally focused on insufficient lead time when price hikes are announced and what independent converters see as "price volatility" in the industry. A representative from Fortifiber said that "the major paper companies need to develop a great deal more stability on paper and board pricing. The companies are very slow to grant discounts to small converters. However, as soon as a general increase is posted, they are very quick to implement it to all size operations. But, generally, I feel that we are fairly treated."

Zimmer Paper Products stated that "price volatility has been a problem for us, especially when pricing takes off on upward spirals that seem to have little to do with traditional economic models. We realize that the paper mills are then subject to the same pressures that they impose on us and for the same reasons—material costs represent a very high percentage of our selling prices. We do not feel that we are unfairly treated by the mills, per se, although it sometimes seems we are put at a disadvantage by the pricing policies of mill-owned converters.

"This disadvantage is not, we believe, because we pay more for the raw paper but because captive converters are not required to generate the machine-hour returns that keep independent converters in business (witness the declining numbers of the latter). In some cases, this practice of 'giving away' the converting processes is a means of guaranteeing tonnage on paper machines. In other cases, it may reflect the ascendant importance of cash flow over profit margin in the financial circumstances of certain large corporations," a Zimmer official explained.

The Atlanta Journal and *Atlanta Constitution* explained that "newsprint pricing, for years, has been greatly influenced by the Canadian paper companies which continue to supply more than 60% of all newsprint consumed in the U.S. Most U.S. producers follow the pricing lead of the Canadians," a Cox Enterprises official pointed out, adding that "newsprint is a significant part of the total cost of producing a newspaper, and no publisher likes a system where the supplier seems to adjust product prices at will. As more newsprint is now being purchased by a growing number of group newspaper owners, including Cox Enterprises, there is a greater balance of pricing power today than in the past. Hopefully, the big Canadian producers will learn to deal with large buyers on a more business-like basis that includes negotiation of paper prices rather than a continuation with the 'announced price' system," he emphasized.



Testing filter paper at James River's filtration products technical lab in Richmond, Va.

Princeton Packaging said that it is difficult to get timely increases from end-users, adding that "mills don't always plan or communicate price changes in order to help independent converters recover those additional costs." Another Fortifiber plant in Tracy, Calif., a laminating, coating, and reinforcing paper operation, felt that the independent converters "should have at least 30 full days on price increases and that orders accepted before perhaps 45 days be at the old price. We cannot easily pass these increases along without proper notice," a spokesman for that plant emphasized.

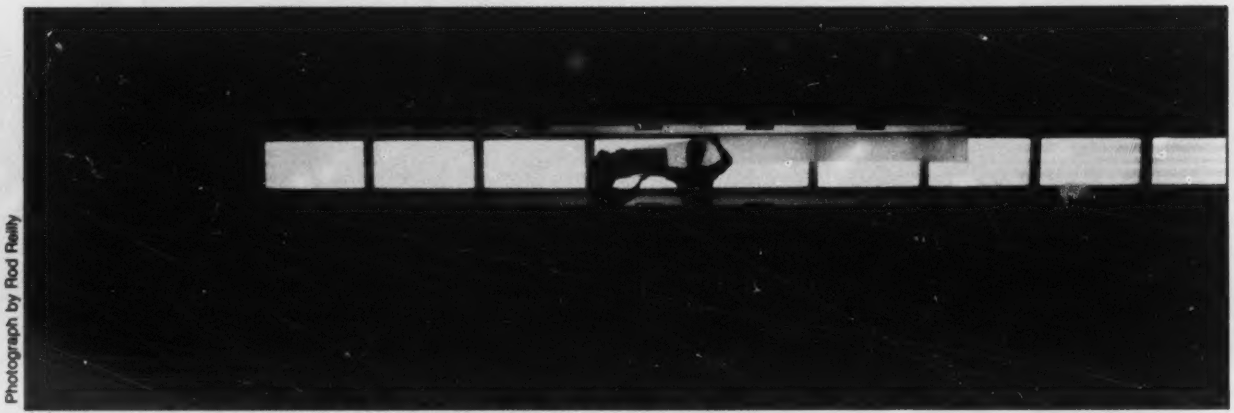
According to Waldorf, "as a converter, many times we see a mill not plugged in as to actual domestic market conditions but looking at factors not directly linked to domestic paperboard, i.e., the demand of pulp markets worldwide." John T. Raisin Corp. pointed to problems on the West Coast caused by apparent price variations in the rest of the country. "There needs to be more uniform pricing throughout the U.S., and paper merchants should be eliminated—they are not well informed on technical problems," a company official said.

Damsky Paper Co. stated that, "generally, we are fairly treated because when prices get too far out of line, we can no longer deal with a source. Over the long run, costs seem to average out." Columbia Corp. expressed the opinion that, with the exception of a few specialty-type grades, paper and board are usually priced to meet market conditions. "We have no particular problems with prices, but we could probably get somewhat lower prices if our business warranted larger purchases," a spokesman stated.

COMMUNICATIONS. Most (84%) of the respondents reported that they do have regular communications with their suppliers regarding problems, needs, etc., as illustrated by Figure 3. Of the 38 converters who answered the question, only two (5%) said they had no contact at all. The people converters report to be most frequently in contact with at the mills are (in order of frequency):

1. Sales staff (40%)
2. Technical reps. (23%)
3. Quality control (17%)
4. Plant manager (13%)
5. Production (07%)

Methods and procedures of communicating with producers vary. Some use photographs to show specific problems with shipments, such as Williams Paper Co. of St. Louis, Mo., (paperboard boxes). This is backed up with an immediate phone call "while everything is still fresh in the memory." General Box Co. of Waycross, Ga., reports regular communications with a very high level of cooperation and exchange, but Orchard Corp. gets a "very slow response as a general rule."


Photograph by Rod Reilly

Checking paper formation at Georgia-Pacific's Port Hudson, La., paper mill.

According to Zimmer Paper Products, "We have close and regular communications at various levels with most vendors, consisting of a vendor certification program which provides advance quality control data, documentation to vendors of every complaint (whether a claim is involved or for information only), regular meetings with sales, technical support, and product managers of supplier mills, and attendance by a delegation of our executives at American Paper Institute's Paper Week to meet with top paper company managers."

Cindus Corp. reported that if their supplier company is small, they can deal directly with manufacturing. But, large paper mills will "force the quality problems through their sales department." A company official added,"this does not work when you are trying to buy special grades. With standard grades, you take what you get. But we need direct communications when we are buying special grades."

Fortifiber, Attleboro, explained that with specialty krafts it buys, "suppliers are very sensitive to the performance of their material on our converting equipment. But, this is not the case with converting kraft/linerboard suppliers who are not responsive to quality complaints about the runability or uniformity of rolls they supply."

On the newspaper side, Richmond Newspapers sometimes communicates through the vendor sales staff. However, it pointed out that most vendors have technical personnel who visit or call at regular intervals. Problems are acted on quickly and with open communications, a spokesman emphasized. The *Atlanta Journal* and *Constitution* has regular, ongoing dialogue between its various production departments and technical representatives of various paper companies they do business with. "Problems arise, but we always receive courteous and prompt attention when they do," an official said. The *Dallas Morning News* communicates on a "regular basis" with its suppliers, at least monthly, in both written and verbal forms.

John T. Raisin said emphatically that most paper companies are not interested "in problems of small users, and their sales people are not well informed on handling quality problems." Chase Bag Co. added that its communications are mainly limited to filing claims for defects.

In response to a question on what paper companies could or should do to better improve relations with their customers, the following comments were most frequent:

- Pay closer attention to delivery dates—keep commitments
- Provide more and better technical assistance in the field
- Give better, faster followup on complaints
- Keep customers better informed on pricing and supply situations
- Sell direct—avoid using paper merchants
- Make greater effort to understand customers' processes.

In response to a question on how mills could help converters improve their products, some typical responses included:

- Improve the product consistency and roll uniformity
- Adjust moisture content for regional and seasonal variations
- Make better roll splices
- Eliminate pin holes, wrinkles
- Concentrate on meeting specifications established by the customers and mills
- Help prevent roll damage with better protective coverings, etc.
- Do not ship questionable or suspect rolls
- Improve smoothness and basis weight
- Minimize contaminants
- Emulate Europe and Japan.

Of the converter companies surveyed, 60% receive shipments by truck, 15% by rail, and 25% by a combination of both. Of the companies using trucks, approximately 25% owned their own. Types of shipping damage reported include: crushed rolls, smashed cores, moisture damage, flat rolls, bruised rolls, and lap damage from forklift or clamp trucks. Much of the damage was attributed to load shifts, with some converters experiencing more damage with rail shipments than by truck.

SECTION II:
CURRENT MILL TECHNIQUES, PRACTICES

In today's international pulp, paper, and paperboard markets, quality assurance is absolutely essential if mills are to compete under both adverse and fortunate readings of the economic barometer. Particularly in the past five to seven years, many mills have taken tremendous strides in the quality control area, installing the latest equipment and initiating some innovative new programs. The technological advances made in electronics, in particular have helped paper producers establish stability in product quality through the development of advanced online and offline measurement devices.

Paper products have evolved to a point where physical and optical properties have to be solid, reflecting the many demands of the converter and printer. Equipment and chemicals have been used to enhance certain end-use properties of some grades. But the majority have had to be "straightened out" by drastically reducing all variations and making product uniformity the key to garnering repeat orders and to gaining access to expanding and new markets.

IMPACT ON PRODUCT. In an effort to determine the extent of current online and offline testing being done in the U.S. industry, *Pulp & Paper* randomly surveyed some 50 pulp, paper, and board mills. Comments from manufacturers of each individual paper and paperboard grade were obtained to identify the impact of online testing and other programs to make a better and more uniform product.

Data in Tables 1 through 4 represent a grade-by-grade sampling of responses from all regions in the U.S. across most paper grades. Table 1 covers linerboard and corrugating medium; Table 2 shows typical properties of coated grades. Table 3 includes uncoated grades; tissue, and newsprint; and Table 4 compares brightness targets for most grades. The following sections incorporate comments from the quality control personnel interviewed at key mills.

SBS GRADES. "Specifications for the product have not changed that much. The end-users have been concerned mostly with printability and graphics capabilities. We, like most manufacturers, will match the product to the end-user. The only real change has been the determination to make paper uniform from reel-to-reel and improve cross-directional uniformity," one mill said.

According to this major producer of solid bleached sulfate (SBS board, "converters are now running at higher speeds and their tolerances have become much tighter. They are less able to tolerate any variation in a specification within every reel. The challenge comes in identifying each customer's critical variables during production. Online gauges have been a blessing, capable of quick evaluation and resolution, enabling the producer to evaluate each reel (with customer's needs in mind) while it's building. When identification and evaluation are complete, performance can be determined."

LINERBOARD. In our study, producers of brown papers documented staggering improvements in profiling (100% to 200% variation reductions were not uncommon). These products are evolving in two directions: one value added (preprint, toplined, mottle) where quality is very important, and the other emphasizing cheaper construction but with strength and performance being equally critical. Producers of both have installed the equipment, and many have increased moisture levels and boosted production. The same is true for many corrugating

TABLE 1: **Targets and ranges for basic measurements in many mills producing brown grades.**

Linerboard	Property	Chief method	Target range
69 lb	Moisture	(online)	6.5 ±0.5%
	Basis weight	(online)	69 ± 1.5 lb
	Surface	S & S Scuff	50 ±5 rev (or strokes)
	Internal bond	Scott	70 + 10 min
	Crush	Ring	110 ± 10 psi
	Burst	Mullen	130 ±5 psi
	Brightness	ISO	15 ±2%
	Absorption		NM
42 lb	Moisture	(online)	5.5 ±0.2%
	Basis weight	(online)	42 ±0.5
	Surface	S & S Scuff	40 ± 12 rev
	Crush	Ring	70 ±5 lb
	Burst	Mullen	100 ±5 psi
	Brightness	ISO	16.5 ±2%
33 lb	Moisture	(online)	6 ±0.2%
	Burst	Mullen	80 ±5 psi
	Brightness	ISO	15 ±2%
Corrugating medium			
26 lb	Moisture	(online)	6.5 ±0.5%
	Basis weight	(online)	26 ±0.3 lb
	Crush	Ring	60 ± 10 lb
	Absorption	Water drop	3 ± 1 sec

medium producers. Table 1 illustrates the targets and ranges for the basic measurements occurring in many mills producing brown grades.

One mill reported that "being a preferred supplier for customers has been a goal in our mill improvements. Installing a profiling control system was one successful step in achieving that goal. Since the system went up, the basis weight profiles have been flat, moisture in the sheet has risen more than a half-percent, and production has increased. The streaks were cut by 40%"

NEWSPRINT. "The twin-wire former deserves much credit for improving the quality of newsprint, such as two-sidedness," one mill emphasized. "When planning our machine improvements, we knew profiling equipment had to be included to keep us competitive in the local market. The communities that are growing rapidly are the same ones that want more colorful and attractive newspapers, and publishers have responded by only accepting products from mills they feel are going to deliver a quality, consistent product in every roll. The profiling control system has reduced moisture variation by 70%, caliper variation by 75%, and basis weight variation by more than 60%."

TISSUE. "The increase in production is what made the front office happy," one mill said about its profiling equipment upgrade, "but it was the peak-to-peak variation that has made the difference. Tissue grades can be tricky to produce and machine breaks are sometimes precarious. The same can be said for the converting end. Yes, we make 10% more paper, but the range from target specs has gone down more than 50%."

"Many of the quality pressures associated with tissue products concern its decorative features, such as shade and pattern," another tissue mill reported. "Not even absorbency is emphasized anymore. But among converting managers, product uniformity is of the utmost importance. When cutting, rolling, printing, etc., the converter must be assured that a slight change in any of the process variables will not interrupt the production run. We now ship products that have less than 2% variation in any critical parameter. Our new profiling equipment has allowed us to speed up our yankee by 10%, and it has adjusted very well."

PRINTING, WRITING GRADES. The biggest push in quality assurance and improvement has come from the uncoated and coated paper grade sectors. These grades are the most widely tested and scrutinized in the industry, causing extreme selectivity among tough-to-please end-users.

Technological advances, primarily involving chemistry, have been key factors in developing better printing and writing papers capable of meeting progressively more stringent end-user requirements. New chemicals for internal bonding, coating, and other uses have produced products with many improvements in physical and optical properties.

Equipment suppliers have been actively pursuing printing and writ-

TABLE 2: **Typical properties of coated publication grades.**

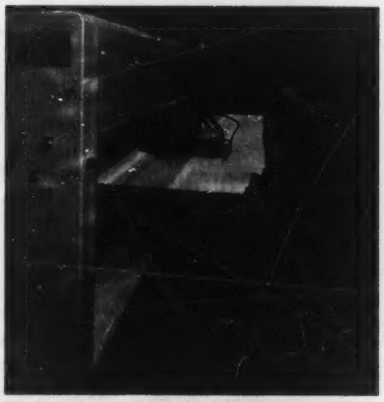
General characteristics	Typical use	Basestock	Coating	Brightness	Gloss range	% Increase 1982-87	Sheffield smoothness
No. 1 Enameled, double-coated, hand-sorted expensive base and coating; high gloss; basis weight above 70 lb	Annual reports	High-brightness chemical pulp; heavily filled	High in TiO_2, high brightness clay synthetics	82-88	<70	10-12	37-40
No. 2 Double-coated, expensive base and coating	Expensive advertising	High-brightness chemical pulp; filled (clay)	High in TiO_2 some clay; expensive synthetics & binders	78-82	68-70	15+	35-40
No. 3 Single- or double-coated, lower-quality basesheet	Advertising	Chemical pulp; minor amounts of groundwood	Mostly clay, some TiO_2, various binders	76-82	65-67	10-15	35-37
No. 4 Lower cost, lower brightness	Magazine	Groundwood and chemical pulp, some clay filler	Lower brightness clay, small amount TiO_2, cheaper binders	72-78	56-60	10	30-35
No. 5 Lower basis weight, high groundwood content	Directories, catalogs, magazines	Mostly groundwood or TMP, chemical pulp for runability	Lower brightness clay, cheaper binders	68-72	>56	10	30-35

ing paper producers, and they have been very successful in selling more sophisticated equipment. Many of the new online scanning packages are targeted for this market. Probably the greatest demand has been for instruments that continuously monitor gloss characteristics. Another piece of equipment, with a significant effect on overall quality of coated printing and writing grades, is the short-dwell coater. Production increases have been realized with this development, along with quality improvements and efficiency gains, explaining its widespread acceptance in the industry.

Printing technology has accelerated rapidly in recent years, being quickly accepted and implemented. In some areas of the country, foreign grades have been bought by printers and converters needing paper with superior performance and appearance characteristics. The domestic market has now reacted to this challenge. With the falling dollar, competition has increased and exports are flattening (especially in the coated area). End-users of these grades have persistently pressured producers to improve specifications, and based on comments from paper companies surveyed, some customers may require even higher appearance and performance from the top coated grades. But for now, many end-user segments appear to be satisfied.

In our survey, both small and large producers of coated paper were contacted to identify the upward shifts in gloss and smoothness. For the larger producers, efforts to improve these vital characteristics began about three years ago when foreign products seriously entered the domestic scene and end-users began buying these then-cheaper goods. Domestic manufacturers countered by employing innovative coating formulations and upgrading calendering equipment to boost the quality of their products. As a result, gloss (TAPPI) and smoothness values rose by 10% or better across all coated paper grades (Table 2).

These improvements can be directly attributed to coating formulations involving binders that help boost surface strength, printability, and appearance characteristics of coated paper. In this regard, the following analysis focuses on enamel grade finishes. However, the performance and appearance of dull and matte finished grades have been similarly improved using many of the same adaptations.



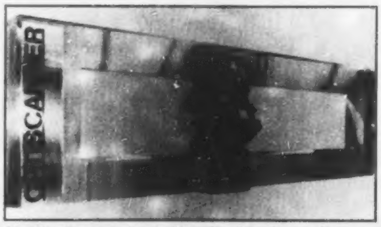
Measurex's Digital Strength sensor as it measures strength properties for Longview Fibre's specialty kraft paper.

The most widely used binder has always been starch due to its price, availability, and, until the mid-1980s, acceptable performance in converting and printing processes. The demands for paper with reduced picking and mottling in four-color offset printing have increased tremendously during the past five years, and chemical suppliers have been at the forefront in providing new components (for old formulations) to help solve these problems.

In using starch, it has been said that binder migration occurs at a certain solids content and is due to evaporation rates where dewatering of the basestock or coating layer is too rapid. This can be reduced by uniform dewatering of the basestock, producing an even surface (one that is not as susceptible to migration of a less sophisticated coating formulation during coat drying). But, components such as SB-latex, CMC-latex, proteins, etc., have proved to be more effective in stifling migration, thus lowering mottling in offset printing.

Binders can both open and close pores of the paper surface, depending on the formulation and coating conditions. Porosity must be evenly balanced with gloss, and herein lies the complications of formulating an ideal coating for wood-free and wood-containing papers. The coat weight variations caused by equipment and chemicals will also cause a variation from ideal or lab produced targets. Strictly from a formulations standpoint, sole binder systems, particularly cheaper ones, are acutely sensitive to variations in coating and forward processing of coated paper. The addition of co-binders to improve retention, surface, and appearance have been used to help obtain a balance between end-use specifications and the existing coating process.

The surest way to avoid mottling is to produce a uniform basestock (discussed in the online testing section below). But short of that, porosity of the printing surface can be adjusted through chemistry. An increase in solids content, maintaining heterogeneity, is one viable solution. For this, calcium carbonate, SB-latex, PVOH, and soya protein have proven capabilities. Published data have shown that as the solids content increases (and the coat weight decreases), Bekk porosity decreases, while K&N values and IGT pick values approach acceptable levels for a given formula, process, and end-use. Mottle improves appreciably as well. This can be shown through methods utilizing the time between inking and subsequent wiping, where a host of intervals, apparati, and samples are also employed, making it difficult to summarize data.



Sentrol's new housing design for online measurement devices.

Increasing the binder will increase pick resistance but will lower porosity, which may adversely affect mottle. Therefore, uniform distribution of the binder system is imperative for suitable cohesion of the coating layer, especially when a sole binder is used. Combinations of starch, latex, and protein have given marketable results in many parameters that can eventually influence print mottle.

Interestingly, these developments apparently began in the East and are now reaching the West. In smaller mills, similar measures were taken to solidify certain specialized market niches. In testing, some mills are now using the Parker Print-Surf test in combination with Sheffield and/or Bendsten smoothness to acquire more information on the finished product. Set targets for Parker Print-Surf are greater than seven (units) for coated stock, indicating that characteristics for the printing surface have improved.

MARKET PULP. Exporters are often the most concerned market pulp producers and, therefore, are very involved in the quality specifications. Recent process changes in the market pulp sector incorporate both equipment and chemicals, and the benefits are integrated in product quality and production cost.

"When planning a recent upgrade project, fiber quality was our top issue," a modern market pulp mill explained. "What could we expect from local timber resources and how would our pulp compare with that of domestic and foreign producers?

"The first thing we realized was that our dirt count would be low due to the dominant amount of roundwood used. It was important to size the barking drums to retain a maximum percentage of bark. The double-screening of chips and the four-stage cleaning was necessary to meet our cleanliness goals. As a result, our shive count is extremely low. In the pulping process, we put in the proven technologies for production of good, strong pulp. We substitute chlorine dioxide in our chlorination stage, use countercurrent washing with filtrates, and use anti-chlor chemicals before high-density storage. Our pulps compare nicely with those produced in northern Europe in properties such as tear, burst, and tensile. The brightness target is 90% ISO, and production of off-spec product since full startup has been negligible."

Table 4 is from *Pulp & Paper*'s annual bleaching survey database. Brightness is taken a few different ways and no conversion factor has been set, making it difficult to generalize the results. It has been even more difficult to compare brightness values with chemical consumption. The data presented here provide only a general picture of brightness targets among most grades.

LATEST ONLINE ADVANCES. A major factor behind most quality assurance improvements in recent years has been the development and installation of online measurement devices that analyze and respond to critical variables during web formation. In the early days of online testing, the instruments were there primarily to facilitate process control rather than assure quality. Now they do both with equal interest from management.

The three most common parameters monitored are basis weight, moisture, and thickness. New products are being offered that look at strength, gloss, formation, ash, and others. On the optical side, brightness, color, and opacity have always been important, but newer ways of obtaining the specifications instantaneously have improved response time and evaluation for future processing in smaller and more technologically advanced devices.

The most significant development involving nearly all grades of paper has been the installation of sensors that track cross-machine direction and machine direction. Signals are translated from the scanner to the computer to an actuator handling the area, and action is taken. Suppliers have been aggressive in obtaining pieces of the actuator business lately.

The cross-direction market is one-third saturated with most sensors being for moisture and basis weight control. Knowing that there is plenty of growth potential in sales for actuators and their new cousins (sensors), suppliers have introduced a wide variety of equipment over the past 12 months.

Measurex Corp., unveiled its digital strength sensor that uses a technology developed at the Institute of Paper Chemistry. Field evaluations have shown close correlations between lab tests and the sensor for burst, tensile, total energy absorbed, and STFI crush. It has been successful in measuring strength variations, optimizing physical property targets while reducing production costs, and allowing a better understanding of how physical properties are affected by process variables. The sensor has been operating on machines at Owens-Illinois Inc., in Valdosta, Ga., Longview Fibre Co., Longview, Wash., and other mills.

Measurex recently entered into a joint agreement with Beloit Corp. to work together on new paper machine systems integrating their product lines. Exchanges in process knowledge as well as further product development may follow.

Earlier in the year, Sentrol Systems was acquired by Valmet Auto-

TABLE 3: **Select survey results for various paper grades.**

Grades	Property	Chief method	Target range
Uncoated			
20 lb-76 lb	Smoothness	Sheffield	100 ±50
	Brightness	Photovolt	85 ±GE
	Moisture	Online	5 ±0.5%
Tissue			
9 lb	Brightness	ISO	80 ±4%
	Absorption	Water drop	1 ±0.5 sec.
	Basis weight	Online	9 ±0.2
Newsprint			
30 lb	Absorption	Water drop	17 ±8 sec.
30 lb	Brightness	ISO	60 ±5%

mation. They have released a new package for their sensors called the Optiscanner. The Optiscanner is designed to protect sensing components against contaminants and to allow access and maintenance while the machine is running. Among the more recent sensors for this scanner are the Poly-Surf analyzer, which checks gloss and scattering, and the Formatone, which defines formation. The controls can be watched by the latest in modular computer control, the Sentry XD.

AccuRay is also actively developing actuators. After being acquried by Combustion Engineering, AccuRay has seen forward integration of the product line has come to fruition. Products include: the Linear Steppe Actuator (slice adjustment), the Thermo-Profiler Actuator, and the Water Spray Actuator. AccuRay has also introduced a new housing system for these sensors called the Microscan Measurement Platform. The scanner can now house the ultrasonic strength sensor and Opti-Pak formation sensor, as well as all other previously released products under the Microscan banner. AccuRay also has a package for the supercalender, now featuring a gloss sensor.

After their highly successful InfraPac system, Impact Systems is now offering some redundancy and a faster actuator response time through a product called the RT nonscanning moisture measurement sensor. The sensor is designed to work with existing profilers, which now take at least one scannng period (30 to 60 seconds) to invoke corrective action. The RT system consists of a stationary array of sensing elements placed in three-inch zones across the sheet, which are capable of measuring CD data every two seconds. The result of this data acquisition and evaluation is an almost instantaneous response. This ability to react quickly to short-term variations makes this sensor ideally suited for the heavier grades. The system is currently online at Union Camp Corp., in Montgomery, Ala., and Georgia-Pacific Corp., in Monticello, Miss.

TABLE 4: **Regional brightness targets for white papers.**

Region	Grade	Brightness
East	Uncoated & coated freesheet	85 GE
	Market pulp	90 ISO
	Newsprint	70 GE
South	Market pulp (hardwood)	91 GE
	Market pulp (softwood)	90 GE
	Bleached board	88 GE
	Uncoated & coated freesheet	86.5 GE
	Tissue grades	88 GE
West	Market pulp (softwood)	91 ISO
	Newsprint	68 GE

OFFLINE AUTOMATION. The past six years have seen a complete turnaround in the paper testing lab supporting production. In the past, labs have been ineffective for real-time evaluation and resolution. Management of all resources of the lab were lax and the support function of the lab became a scapegoat for customer problems. But when the dollar went up and imports rose, particularly for the value-added products, quality became a central issue in regaining strength in the maintained and lost segments of the market.

The advent of the microprocessor radically changed test equipment. Now the data acquisition and management equipment are bringing testing information to the production floor, restoring the support function for which the labs were originally intended. The labs are now able to provide production personnel with a larger picture of their process. As more managers and engineers employ statistical methods of evaluation in process and quality control, the need for reliable data and complete knowledge of the sampling universe is imperative for solidifying confidence in the results.

Most mills have purchased modern instruments using digital readout and solid-state electronics. The degree of sophistication of a device is often dictated by its price, so the type of equipment the mill will get is specific to the amount of funds allocated for each part of the lab. The result is a varied and wide-ranging picture of paper testing in domestic mills.

Some mills have attempted to upgrade their labs by installing a microcomputer to facilitate storage and acquisition. This step can provide a false sense of security in that labor has been added but automation has not taken place. Slowly but steadily mills are placing automatic testing features in the labs with equipment using leading-edge technologies like robotics and artificial intelligence.

Suppliers have used several approaches to introduce their products. All have been reasonably successful and should see more growth in the future. Also, advances in the electronic industry will probably keep development active.

In fully automated systems, a product called the Testream, marketed by AcquiData, Inc., of New Rochelle, N.Y., can interface over 100 of the current offline testing machines and deliver the information automatically to every area of a paper mill. In a recent example of how Testream is used, a mill testing with 16 instruments needed information pulled from the tests done in several areas in the mill, so it employed the following procedure. The processed data was routed to terminals on the machine floor, sent to a mainframe, dumped into a database, and was also made available to production teams who employed a statistical package for process capability studies.

The concept of filling those requests from the testing lab may have been basic, but the electronic engineering and design of the system was extremely complex. The product was in development four years and has been on the market for two years. A key feature is the remote support, as maintenance can be handled from the manufacturer's location. The system is used by a wide variety of paper grade manufacturers and research labs. A customer from Japan told a TAPPI audience recently that productivity in his testing labs has jumped 50%.

RoboTest is offering multi-test apparati called the PaperLab and the MicroLab. Each processes a sample in a stand-alone unit and reports on standard tests (up to 16 for the larger unit) that are performed simultaneously. The system can be programmed for TAPPI, CPPA, ISO, and SCAN testing procedures and standards. The correlation of PaperLab results with TAPPI standards are said to be less than +1.0%. The units have been installed at six locations in North America--on newsprint (Kruger, Quebec), coated paper (Niagara of Wisconsin), and four other unnamed mills.

An example of the innovative opportunities of using a PaperLab comes from the Summa Mill of Enso-Gutzeit OY (Finland). Here the PaperLab-16 is situated between the dry ends of two paper machines. The production department at this mill has the responsibility of testing each reel. The reporting feature focuses on the exception rather than just data. If a specification is off, the report indicates to what degree. This gives the machine operators the ability to accept and reject paper and correct the process without having to wait for an evaluation from the technical department.

In North America this unit has helped boost the productivity of mill laboratories. Reels are tested much more frequently than in the past (from "every so often"--by shift or reel number--to nearly every reel) without an increase in testing costs. The return from a purchase comes in three ways: reduction of labor, enhanced quality maintenance and control (difficult to assess accurately), and optimization of process variables (the greatest being raw material inputs, which are easy to assess). Returns can be realized within eight to 18 months for most mills.

On the optical side, the microprocessor has made several tests available on one device. Jamming many tests into a single instrument has reduced labor and time in receiving data. Technidyne is now marketing a product for testing brightness, opacity, color, scattering, and other parameters, and also a printer that prompts the technician during the acquisition. Hunter Associates, whose founder was the pioneer of online optical property measurement, maintains its successful instruments that watch color, brightness, gloss, and other appearance characteristics. The latest feature is making the testing machine's information available to microcomputers.

In the strength testing area, the major changes have been in computerization, console control, user-friendliness, and now, robotics. Instron, famous for its products in tensile testing, has sold a half-dozen systems that employ robots for sample loading and testing. Information can then be sent to a microcomputer where the software generates a report on the present set of data. Thwing-Albert Instruments, which is the only manufacturer of Elmendorf tear testers until recently, is also automating its product. Signals from these testers can also be received by microcomputers and processed according to the user's needs.

Testing Machines Inc. has recently introduced a line of compression testers capable of many new functions not available with previous models. Acceptance of the new testers is reportedly high. TMI is also marketing a data acquisition device known as the Monitor X series, which is equipped with other TMI testers or can be interfaced with existing testers. The Monitor series allows users to build a fully automated lab, as each piece is a stand-alone, intelligent work station. The signals are sent to a microcomputer for use in word processors, databases, and spreadsheets.

Interestingly, the development of testing instruments is quite often driven by customers. This is somewhat of a unique situation. Many suppliers commented that their instrument, or one by a competitor, was not providing data as completely as was deemed necessary in evaluating product quality. An example of this situation is the stiffness tester sold by TeledyneGurley, where the instrument is being redeveloped. Customers required a more defined quality of stiffness and more usable test data with which to predict or associate particular process variables. The result is a new measuring device and a clearer picture of the stiffness characteristic.

The research associations have also been active in developing testing equipment and methods. IPC cultivated a runability measurement for corrugating medium that checks fracture points. It is now sold by Liberty Engineering. STFI has been active in developing compression testing for material used to make boxes (marketed by Scanpro).

SUMMARY. Paper testing is riding a high-tech wave that could go on indefinitely. Archaic instruments and paper testing evaluation, the majority of which most papermakers have been exposed to, are gone and will be quickly forgotten. Labor has been reduced and reliablity has been restored. New equipment and chemicals have produced products faster and with better quality, and today's labs can actively contribute to those profit centers.

The online testing in mills today is truly remarkable. Initiating corrective action to well-designated actuators for maintaining the product quality in each individual reel is progress. And such progress is desperately needed to compete in an international market that is relentlessly expanding. Mills installing the online sensors are more than satisfied with the results, and many have commented that a future has been ensured for them through a new confidence in their products.

Offline automation will also continue, and the integration of information with the online devices can be managed in such a way as to guarantee competitive quality products. This situation is creating a healthier production environment that can withstand the economic cycles prevalent in today's world paper industry.

SECTION III:

THE STATISTICAL APPROACH TO QUALITY

No matter what standards pulp and paper mills use to measure the quality of their products, chances are very good that they will be using statistical quality control SQC, or statistical process control SPC, to make sure those products will consistently meet their standards. In fact, many manufacturers are going a step further and demanding that suppliers of their raw materials also apply SQC to their products, as they in turn are being required by their customers to implement SPC.

Statistical process control is defined as the application of accepted statistical methods to determine if a given process is within the operating control limits established by those statistical methods. Statistical quality control is the application of accepted statistical methods to determine if a given process is within the operating control limits established by those statistical methods and is producing a product that may be shown statistically to be acceptable for the end-use requirements. These statistical methods attempt to minimize the variation in both the process and the product, while constantly trying to reduce it.[1]

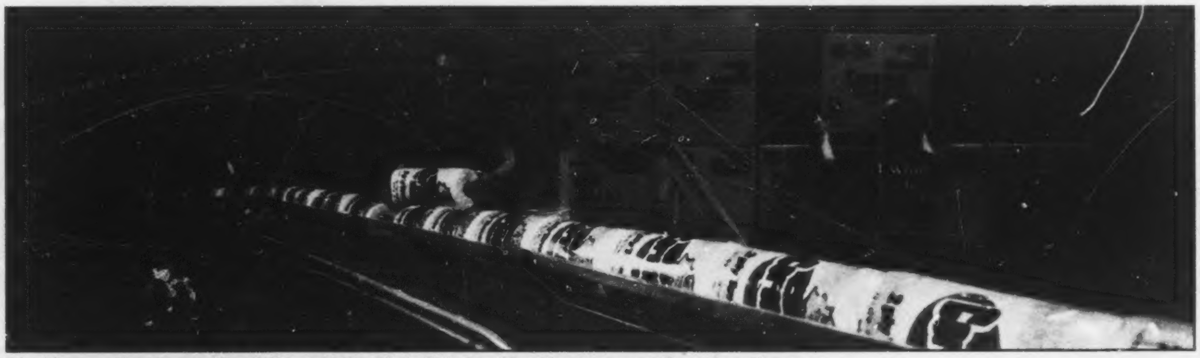
SQC/SPC is based on the philosophy of Dr. W. Edwards Deming, an American statistician, as described in the book *Quality, Productivity, and Competitive Position*, published by the Center for Advanced Engineering Study at the Massachusetts Institute of Technology. Dr. Deming taught his philosophy to the Japanese to help them rebuild their industry after World War II, and SQC/SPC techniques have helped make Japan the industrial powerhouse it is today. It may seem surprising that the highly touted Japanese management techniques are actually based on the teachings of an American; however, there is no doubt about their effectiveness and the results achieved. Dr. Deming's "14 Points for Management." are listed in Table 1.

Federal Paper Board Co.'s Riegelwood, N.C., mill was the first U.S. operation to apply SQC/SPC to pulp- and papermaking. Federal Paper began its SQC/SPC program in 1982.[2] However, it is safe to say almost every pulp and paper manufacturer has begun or will implement an SQC/SPC program.

Some common notions of SQC/SPC teachings are:[2]

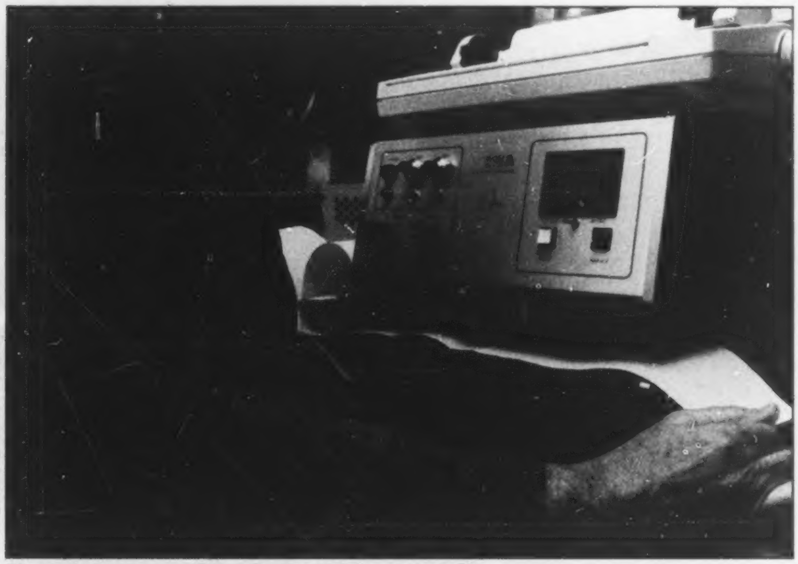
- Workers want to do a good job
- Workers work within a system
- Approximately 85% of all problems are systems or management problems that must be corrected by management
- It is cheaper to make something right the first time
- Quality must be controlled at every step in the manufacturing process, not just at the end
- SQC/SPC is not a quick fix
- SQC/SPC must be used forever to achieve constant improvement
- For SQC/SPC to be effective, it must have full commitment and involvement of management
- An SQC/SPC program must be designed with an implementation plan.

MEASURING VARIATION. Manufacturing processes for making cars or paper, all vary somewhat from week to week, from day to day, and from minute to minute. Much of this variability (probably 85%) is really due to chance and is not within the normal control of the operators. However, the basis of SQC/SPC is that this variability can be measured, and it can be separated into assignable causes that, once identified, can be eliminated one by one, either by the operators or with the help of the operators. It can also be separated into common causes that, once identified, can only be eliminated by management actions. According to



Photograph by Steve Dinberg

Final inspection for quality at Georgia-Pacific's Palatka, Fla., tissue converting operation.


Photograph by Jim Robinson

Measuring paper profile at Crossett, Ark., paper mill.

SQC/SPC, it is much better for the operators to leave systems alone if they are dealing only with common causes. By eliminating assignable causes and working to reduce common causes, variability is decreased and quality is improved.

Rather than make random or misguided adjustments to the process, operators plot certain variables to statistically identify and separate variations that should be corrected by operator-initiated actions from those caused by the nature of the process itself or by chance. Data that is relevant to the process must be collected and put into a picture/graph form so that the operators can readily see what is happening. This picture/graph, known as a control chart, is a line graph that has been enhanced with control limits--lines placed at plus or minus three standard deviations from where the process normally runs. Figure 1 is an example of a control chart used by Federal Paper at Riegelwood for batch digester K number control.[3] The limits on this chart allow each operator, whether experienced or not, to see any particular point on the profile as either "good" or "bad." There is no need for judgment calls because the limits define where the natural variation ends and the unnatural variation begins.

Most SQC/SPC functions use two types of control charts--the X-bar, or average, chart and the range (R) chart. An X-bar chart is usually kept by the operators in conjunction with a range chart. The X-bar chart tells where the process is running on the average, while the range chart tells how much variation there is from sample to sample. When a range chart kept on an automatic process goes out of control (out of the control limits), it normally means that the equipment needs adjustment or repair. If a range chart kept on a manual process (such as multiple tests run on the same sample in a laboratory) goes out of control, it usually indicates that the person running the test is not using the same method of testing from sample to sample.[4] It is important to note that the average and control limits are statistically determined for the process in question and do not represent targets or standards. Standards may be arbitrarily imposed and may not represent what a process is actually capable of achieving.

STARTING A PROGRAM. Most mills view the SQC/SPC programs as an enhancement of their quality control and/or human resources programs. Much of the statistical manipulation and plotting of process variables required by these programs could easily be done by the process control systems in place at mills. However, a key to these programs is getting the operators more involved and aware of the process. Therefore, most SQC/SPC programs involve manual plotting of data points on the control charts by operators. SQC/SPC helps make operators more aware of what the process is doing and enables them to take proper corrective action sooner. It requires that operators communicate with each other and become more concerned with quality.

TABLE 1: **Dr. Deming's 14 points for management.**

1. Create constancy of purpose toward improvement of product and service.
2. Adopt the new philosophy: acceptance of poor product and service is a roadblock to productivity.
3. Cease dependence on mass inspection; replace by improved processes.
4. End the practice of awarding business on the basis of price tag alone.
5. Find problems and fix them; continually reduce waste and improve quality.
6. Institute modern methods of training on the job.
7. Institute modern methods of supervision.
8. Drive out fear.
9. Break down barriers between departments and locations.
10. Eliminate numerical goals, posters and slogans. Don't ask for new levels of productivity without providing methods.
11. Eliminate work standards and numerical quotas.
12. Remove barriers that stand between the worker and his right to pride of workmanship.
13. Institute a vigorous program of education and training.
14. Create a structure in top management that will push every day on the above 13 points.

The decision to begin an SQC/SPC program must necessarily be made by upper management, and the implementation of such a program requires a strong management commitment to succeed. Upper management may then form a steering committee which includes a cross-representation of personnel from manufacturing, financial, and marketing management. An SQC/SPC implementation team will usually be formed. Many companies feel they need a staff "champion" to act as house expert and oversee the program. A champion like that may have received training in SQC/SPC techniques from an organization such as Tennessee Associates in Alcoa, Tenn. Tennessee Associates has trained people from ten U.S. pulp and paper companies in SQC/SPC implementation techniques as part of its "Managing for Consistency" program. It emphasizes that statistical techniques are only part of a quality improvement program and that assessment and improvement of the "culture" is also necessary.

The first step in implementing an SQC/SPC program at the mill level is usually a pilot project that monitors a few variables such as brightness, K number, moisture, basis weight, or coat weight. The variable(s) chosen for plotting are those that are important because they affect the quality of the process and are controllable by the operators. Variables are added as the program progresses. As an example, Federal Paper's Augusta, Ga., mill, currently plots control charts for 23 variables in the paper mill (three machines) alone.[1]

A large quantity of data is gathered and plotted to determine the natural variability of the process and set the initial control limits. The time period covered by this data must be sufficient to be a representative sample, and it may vary from one day to one year or more depending on the process. From the analysis of the baseline data, control charts are constructed. Foremen and supervisors are usually trained first in SQC/SPC techniques and theory. Operators are trained next with a con-

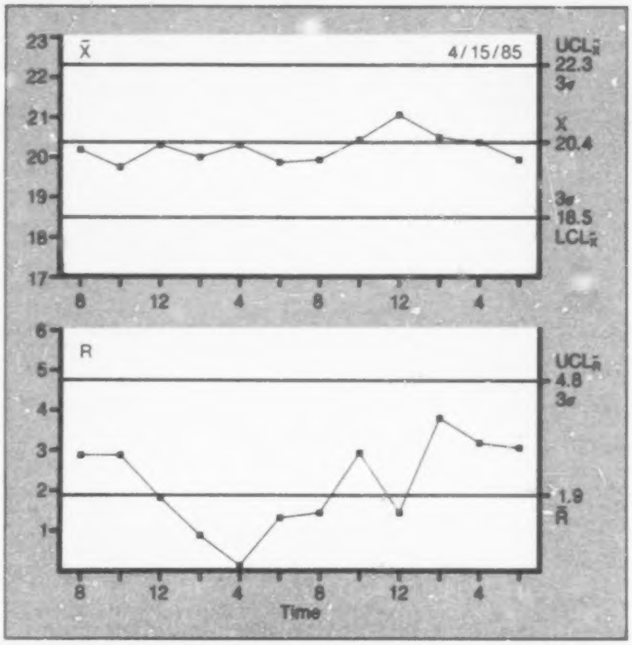


FIGURE 1: **Control charts for a batch digester, K numbers used at Federal Paper Board.**

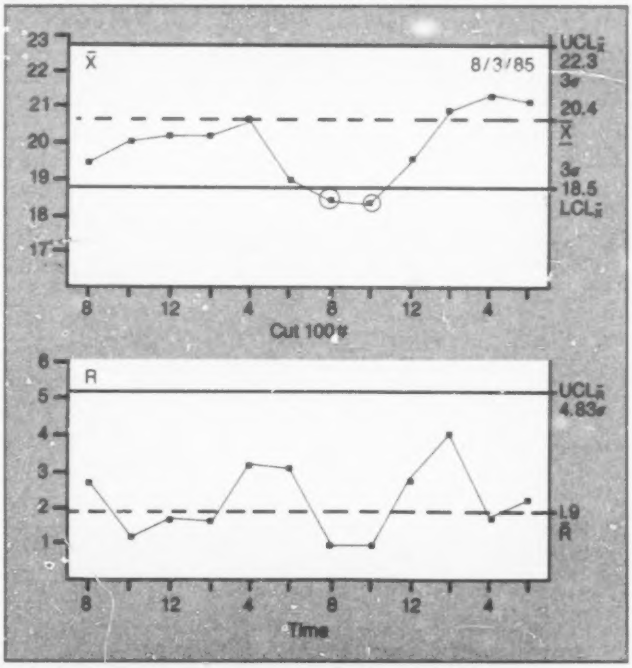


FIGURE 2: **K number control charts showing the process out of control at 8:00 and 10:00 p.m.**

Guidelines for success in SPC

1. Have a person knowledgeable about both your process and statistics either in the organization or as a consultant to keep the program on track
2. Use people who are primarily process oriented for the day-to-day upkeep and maintenance of the system
3. Stick to simple statistics
4. Introduce SPC to the operators as another tool for them to use so they can do their jobs better and easier
5. Keep moving forward, rarely stand pat

centration on implementing the program. The curriculum may include the philosophy behind the program, how to use a calculator, basic mathematical concepts (such as how to plot an average and a range), and how to plot and read points on a line graph. They also learn to make control charts in order to understand what a control chart is and how to use one.[4]

In the example of the control chart shown in Figure 1, operators were plotting the three-term moving average (X-bar) and range (R). The three-term moving average is used for the K numbers because it dampens swings in the data points, analogous to mixing that will occur in latter stages of the process. Use of a three-term average also reduces op-

FIGURE 3: **Example of control chart data calculation and plotting for hypothetical paper test values.**

Data for variables control chart ($\bar{X}$ & R)

Reel averages and ranges
(5 tests per reel/subgroup)

Reel Number	$\bar{X}$	R	Reel Number	$\bar{X}$	R
1	55.4	2	16	55.8	4
2	54.8	3	17	52.4	7
3	53.6	7	18	54.8	3
4	54.0	6	19	54.2	3
5	54.4	5	20	54.0	4
6	54.0	8	21	55.2	4
7	54.4	4	22	55.0	6
8	54.2	3	23	55.2	4
9	54.2	4	24	54.8	8
10	53.4	5	25	55.2	1
11	53.8	5	26	54.0	2
12	53.2	3	27	53.4	3
13	53.2	3	28	53.6	5
14	54.2	2	29	52.8	5
15	55.2	4	30	55.2	3

$\bar{X}$ = Reel average.
$\bar{\bar{X}}$ = Overall average.
R = Reel range.
$\bar{R}$ = Average range.

Control limits for $\bar{X}$ and R charts
(From statistics handbook)

Number of observations in subgroup, N	Factor for $\bar{X}$ chart A_2	Factors for R Chart Lower control Limit, D_3	Factors for R Chart Upper control Limit, D_4
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2.00
7	0.42	0.08	1.92
8	0.37	0.14	1.86
9	0.34	0.18	1.78
10	0.31	0.22	

$$\bar{X}\text{ (for each subgroup)} = \frac{\text{sum of measurements in subgroup}}{\text{number of measurements in subgroup}}$$

$$\bar{\bar{X}}\text{ (central line)} = \frac{\text{sum of }\bar{X}\text{ values}}{\text{number of subgroups}}$$

$$\bar{R}\text{ (central line)} = \frac{\text{sum of R values}}{\text{number of subgroups}}$$

$\bar{X}$ Upper Control Limit: $UCL_{\bar{X}} = \bar{\bar{X}} + A_2\bar{R}$
$\bar{X}$ Lower Control Limit: $LCL_{\bar{X}} = X - A_2\bar{R}$
R Upper Control Limit: $UCL_R = D_4\bar{R}$
R Lower Control Limit: $LCL_R = D_3\bar{R}$

Calculation of control limits

$$\bar{\bar{X}} = \frac{1827.5}{30} = 54.25$$

$$\bar{R} = \frac{126}{30} = 4.2$$

$\bar{X}$ Upper Control limit: $UCL_{\bar{X}} = 54.25 + (.58)(4.2) = 56.69$

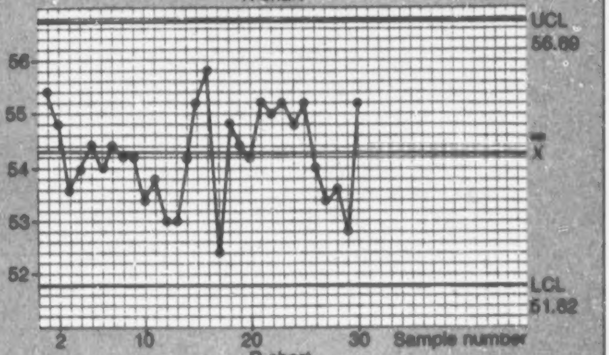
$\bar{X}$ Lower Control Limit: $LCL_{\bar{X}} = 54.25 - (.58)(4.2) = 51.82$

R Upper Control Limit: $UCL_R = 2.11\ (4.2) = 8.86$

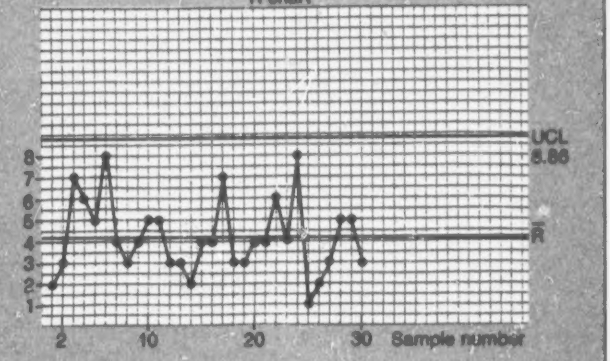
R Lower Control Limit: $LCL_R = 0\ (4.2) = 0$
No lower limit for range

$\bar{X}$ R charts

$\bar{X}$ chart



R chart



Example courtesy of Vann Parker, technical and quality assurance mgr., Federal Paper Board Co., Augusta, Ga.

erators' reactions to events that, simply by the operators' response to them, would tend to increase variability. In this example, when the process is in statistical control, the average and range of the K numbers will fall within the control limits, and the running average will straddle the long-term average. When points violate the control limits (UCL_x, LCL_x) there is a 99.7% probability that an upset has occurred. In other words, the control limits define the short-term, natural variability of the process. When the three-term running average or range falls outside the control limits, it means something abnormal has happened. The control chart itself does not reveal what has happened, only that an upset has occurred. Then it is up to the operators to identify and report the problem and take appropriate corrective action when possible.

Figure 2 shows another Federal Paper control chart for K numbers where the running average drops sharply (at 6:00 p.m.) and violates the lower control limits on the average chart (at 8:00 p.m.).[3] The operator recognizes from the 6:00 p.m. entry that an abnormal event has occured and takes a small control action. The process responds six hours after the operator intervention by coming back within the normal control range statistically determined for this process. In this case, six hours is the theoretical residence time from the beginning of the cook to when the test is called in from the lab.

The use of control charts allows the operators to determine when a process upset has occurred. The operators then use their knowledge and grasp of events to decide what, if any, control action is warranted. Without control charts, the operators have to rely on their experience and intuition to determine when it is necessary to intervene in the process. Often, when control charts are first determined for certain variables, management will note that the limits are actually much wider than wat would have been considered acceptable operating practice. This is because, prior to SPC/SQC, normal process variation was sometimes interpreted as an upset, leading operators to over-control their processes.

Figure 3 is an example showing data manipulation and plotting for a hypothetical paper test with five tests per reel.[1]

BEYOND CONTROL CHARTS. The SQC/SPC programs, once implemented, can go far beyond the generation of control charts. To help determine causes for points outside the control limits, Ishikawa diagrams may be prepared by management with the operators' input. These diagrams, sometimes called "fishbone charts," offer a systematic cause-and-effect way of identifying the real source of specific problems (Figure 4).[5] In addition, the complex relationships between the process variables can be more clearly understood. As causes for points out of control are identified, charts are prepared to quantify and rank the most frequently recurring ones. The charts, called Pareto diagrams, are useful in directing management's attention to the most serious, and the most easily corrected, problems. Figure 5 shows a Pareto chart from Federal Paper ranking system problems causing batch digester K number variations.[3] Obviously, to achieve significant improvements in quality, it is necessary to deal with the most frequent problems. Most of the problems identified by the bar chart in Figure 5 are not cross-hatched. The cross-hatched areas represent only those events over which the digester operators have direct influence. Without a statistically based program, it would be easy to blame the operator for process upsets.

Quality control testing at Stone Container's Missoula Mont., mill.

Photograph by Rod Reilly

Testing properties of linerboard and corrugating medium at G-P's Doraville, Ga., Container Div. technical center.

Consolidated Papers at Wisconsin Rapids, Wis., has begun using a variation of the conventional control charts called a "zone control chart" (Figure 6).[6] The zone control chart procedure uses statistical tests for detecting a process shift, as shown in the *Western Electric Statistical Quality Control Handbook*. It is said to be a simplification which eliminates many of the difficulties with control chart construction, plotting, and interpretation, and it has been called an all-purpose chart that can be applied to any data that fit the normal distribution. Another advantage is its ability to quickly distinguish special causes of variations from common ones. ■

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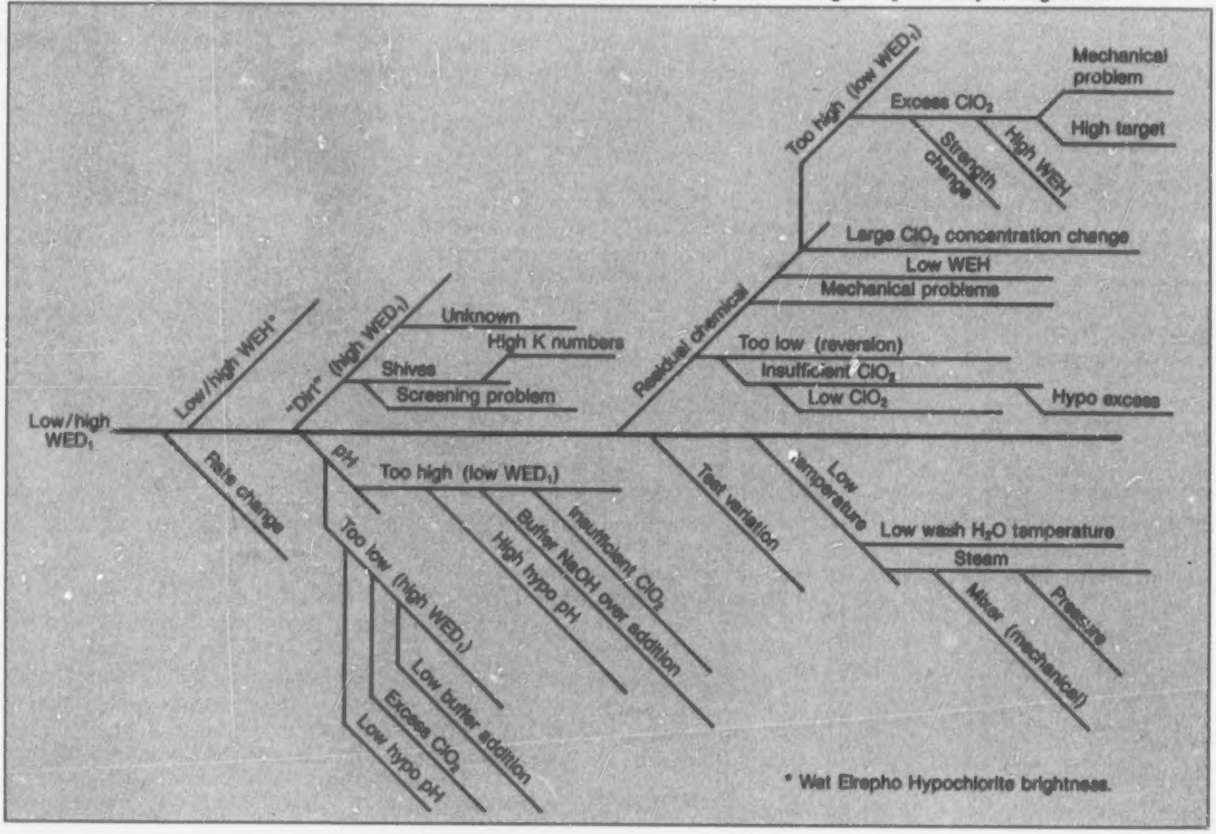
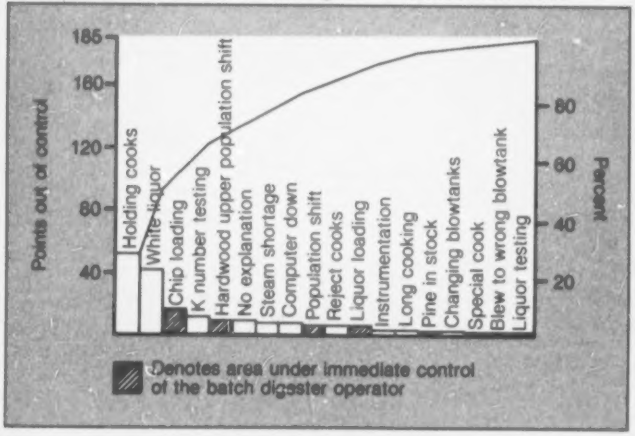
FIGURE 4: **Ishikawa diagram for troubleshooting process variations for bleach plant first stage ClO$_2$ wet Elrepho brightness.**


Low/high WED$_1$
Low/high WEH*
Rate change
"Dirt" (high WED$_1$)
Unknown
High K numbers
Shives
Screening problem
pH
Too high (low WED$_1$)
Insufficient ClO$_2$
Buffer NaOH over addition
High hypo pH
Too low (high WED$_1$)
Low buffer addition
Excess ClO$_2$
Low hypo pH
Residual chemical
Too high (low WED$_1$)
Excess ClO$_2$
Mechanical problem
High target
Strength change
High WEH
Large ClO$_2$ concentration change
Low WEH
Mechanical problems
Too low (reversion)
Insufficient ClO$_2$
Low ClO$_2$
Hypo excess
Test variation
Low temperature
Low wash H$_2$O temperature
Steam
Mixer (mechanical)
Pressure

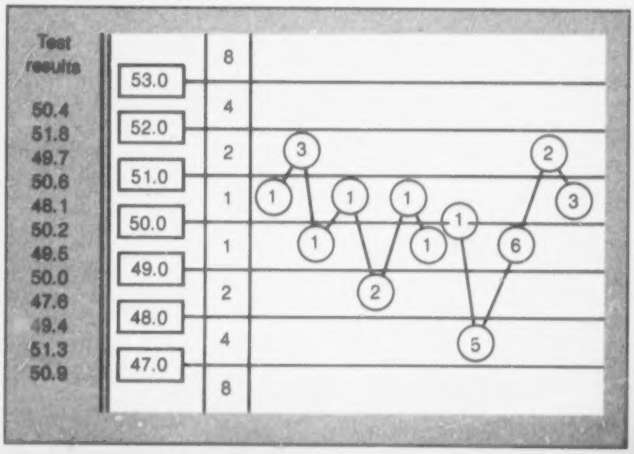
* Wet Elrepho Hypochlorite brightness.

FIGURE 5: **Pareto chart for batch digester K number variations.**



▨ Denotes area under immediate control of the batch digester operator

FIGURE 6: **Zone control chart for a process with a target of 50 and a standard deviation of 1.0.**



GLOSSARY OF TERMS

ABRASIVENESS: A characteristic of finished paper that indicates its potential for abrading other materials as it moves in contact with them. The degree of abrasion and wear is generally related to additives in the paperstock, as well as any "external" coatings, rather than the fibers themselves.

ABSORBENCY: That property of pulp, paper, and its constituents and products which permits the entrainment and retention of other materials it contacts, such as other liquid, gaseous, and solid substances.

AGING RESISTANCE: The ability of pulp or paper to maintain certain physical properties such as strength and brightness over long periods. Sometimes referred to as stability or permanence.

AIR PERMEABILITY: A paper sheet characteristic which allows air to pass through its fiber formation. It is measured by subjecting a specified sample to standard pressure differences across its boundaries under known conditions of temperature and relative humidity and determining the rate of airflow.

ALPHA-CELLULOSE: The portion of pulp or other cellulosic materials that will not dissolve in 17.5% strength caustic solution at 20°C.

BASIS WEIGHT: The weight, in pounds, of a ream of paper, usually consisting of 480, 500, or 1,000 sheets of a specified size as stated in the definition of the basic size for the specified grade. The standard ream size varies with different grades of paper according to trade practices. As a general reference, sometimes the weights are converted and expressed as the weight of an arbitrary standard ream of 500 sheets, 24 in. x by 36 in.

BONDING: The sticking together of papermaking fibers, which provides toughness and strength to the paper.

BREAKING LENGTH: The calculated limiting length of a strip of paper or board of any uniform width beyond which, if such a strip were suspended by one end, it could break by its own strength. Its value is calculated from the tensile strength and the basis weight of the sheet in expressing paper and pulp testing results.

BRIGHTNESS: A measure of the degree of reflectivity of a sheet of pulp or paper for blue light measured under specified light standard conditions. Same as whiteness. Usually expressed as GE or ISO, depending on instruments and procedures used.

BULK: The compactness property of a sheet in relation to its weight (Whose value decreases as the compactness increases). It is measured as the thickness of a pile of a specified number of sheets under a specified pressure.

BURST: (1) The pressure in pounds required to rupture one square inch of paper under stipulated testing procedures. The most common procedure to break the paper is by expanding a flexible diaphragm against a securely held circular area of paper. The Mullen tester is an example. (2) Refers to a defect in paper characterized by a rupture in the web not extending to the edges.

CALIPER: The thickness of a sheet of paper or paperboard, measured under specific conditions, expressed in units of thousandths of an inch. "Mils" is used when referring to paper, and "points" when referring to paperboard. Also called thickness.

CLEANLINESS: A reference to the degree of dirt or spots on paper. Several procedures, some including the actual counting of these imperfections in a small area to determine average levels in a sheet, are used to grade paper or board by cleanliness.

COARSENESS: A property of pulp related to the refining, fiber perimeter, and wall thickness characteristics as it affects the weight per unit length of the fiber.

COAT WEIGHT: Refers to the amount, thickness, etc., of the layers of mixed clays and adhesives, etc. that are applied to the surface of paper or paperboard to create a new surface.

COHESIVENESS: A refining term referring to the intrinsic attraction of fiber surfaces, which equals the shearing stress divided by the relative bonded area.

COLOR: (1) The dyes and pigmented mixtures used to treat paper or paperboard and the visual effect it produces in the product and on its surface. (2) The act of accomplishing a visual effect on paper and paperboard by using dyes and pigmented mixtures.

COMPRESSIBILITY: The amount the sheet caliper will decrease under a specified load or use. In printing, referred to as cushion.

CONSISTENCY: Referring to finished paper and paperboard, it is used to denote shipment-to-shipment uniformity. Seeuniformity.

CREASEABILITY: Physical property of paper that resists the breaking away of the surface coating along the crease on folding.

CRUSH RESISTANCE: The physical property of paper and paperboard that is resistant to compression loads.

CURL: A paper or paperboard deformation caused by nonuniform distribution of strains and stresses throughout the sheet due to uneven internal moisture and conditioning.

DENSITY: With reference to paper and paperboard sheets, it is the ratio of the weight to volume, with high-density paper and paperboard having a high weight-to-volume ratio.

DIMENSIONAL STABILITY: A sheet characteristic indicative of its ability to maintain original machine and cross-machine dimensions with time and under variable moisture and relative humidity conditions.

DIRT: Undesirable, extraneous, contaminating material in pulp, paper, or paperboard which is visible in transmitted or reflected light. *See also* cleanliness.

DRYNESS: Air dry: Refers to weight of moisture-free pulp or paper plus 10% moisture based on a traditional assumption that this

amount of moisture exists when they come into equilibrium with the atmosphere, which in actuality is dependent on the conditions of the atmosphere to which it is exposed. Air-dried weight is determined by dividing the oven-dried weight by a factor of 0.9.
Bone dry: (1) A descriptive term for the moisture-free conditions of pulp and paper. (2) Refers to air containing absolutely no vapor.
Oven dry: Moisture-free conditions of pulp and paper and other materials used in the pulp and paper industry. It is usually determined by drying a known sample to a constant weight in a completely dry atmosphere at 100°C to 105°C (212°F to 221°F).

FADE: The slow loss or change in color of paper. It is usually caused by exposure to light over a period of time.

FIBER LENGTH: The average length of fibers in the mass of pulp or furnish stock.

FOLDING ENDURANCE: Refers to ability of paper or board to withstand repeated bending and folding with a minimum of damage. The paper mill lab test for folding endurance is made on a specific strip of paper. It determines the number of double folds that can be made under specified tension conditions before it will break and is a measure of the folding properties of the sheet.

FORMATION: The physical distribution and orientation of fibers and other solid constituents in the structure of a sheet of paper which affects its appearance and other physical properties. Also referred to as look-through because the formation can sometimes be observed by looking through the sheet.

FREENESS: The ability of a paper and water mixture to release or retain water on drainage. The ease or lack of ease with which the mixture or slurry will drain water is sometimes referred to as slowness or wetness. Usually measured as Canadian Standard freeness (CSf), referring to a specific test procedure.

FUZZ: Fine fibrous extensions that occur on paper and paperboard surfaces. These fibrous extensions are the result of improper refining in the stock preparation area, the use of excessive vacuum during the sheet formation phase, or the use of insufficient sizing material.

GLOSS: That property of a paper sheet surface that produces a shiny, highly reflective appearance when light is reflected from on it. *See* Reflectance.

GLUABILITY: The measure of paper or paperboard's ability to accept or "hold" glue, i.e., to be glued.

GREASE RESISTANCE: The ability of paper or paperboard to resist the penetration of oil or grease. A greaseproof paper is a protective wrapping specially coated with materials to make it resistant to grease or oil, or the stock that it was made from was highly hydrated by mechanical refining of chemical woodpulp to make it greaseproof. Coatings include casein, lacquer, hotmelt, resin, or silicate--this type of paper is generally referred to as glassine.

HANDFEEL: A term used to express the impression obtained by handling paper to judge its finish, flexibility, and general quality.

HARDNESS: (1) The physical characteristic of paper or paperboard related to its resistance to damage by impact. (2) The density of a rubber covering on press rolls. (3) A water quality related to the calcium, aluminum, iron, and magnesium concentration.

HOLDOUT: The ability of paper or paperboard to resist surface liquid penetration.

HYDROEXPANSIVITY: That property of a sheet of paper related to the dimensional change occurring during a change of relative humidity of the surrounding air.

INK RECEPTIVITY: The ability of paper and paperboard to take up and retain oil-based type inks.

INTERNAL BONDING STRENGTH: The sticking together of fibers within the paper or paperboard sheet structure that provides toughness and strength.

JOB LOT: Out of specification, defective or discontinued types of paper. It is made up in small quantities for special orders and sometimes sold at a lower than standard price.

KAPPA NUMBER: A value obtained by a laboratory test procedure for indirectly indicating the lignin content, relative hardness, or bleachability of higher lignin content pulps, usually with yields of 70% or more. It is determined by the number of milliliters of tenth-normal permanganate solution (0.1 $KMn0_4$) which is absorbed by 1 gram of oven-dry pulp under specified conditions and is then corrected to 50% consumption of permanganate.

LATENCY: The curl and spiral of individual pulp fibers produced during the mechanical action in refiners, especially in the thermomechanical pulping process.

MOISTURE CONTENT: The percent of water by its weight in paper, pulp, paperboard, chips, etc., which will vary according to atmospheric conditions because of the ability of these types of materials to absorb or emit moisture.

MOISTURE RESISTANCE: The ability of paper and paperboard to resist the penetration of water and water vapor.

OFF-SPEC: Shipments of paper received by customers that are not of the specifications ordered.

OPACITY: That ability of paper to resist the transmission of both diffuse and nondiffuse light through it. It prevents show-through of dark printing in contact with that backside of a sheet of paper. *See also* Show-through.

OUT-TURNS: Paper samples of orders run on a paper machine and used for mill or customer records.

PERMEABILITY: That property of paper and paperboard directly related to the ability of a fluid to penetrate and spread throughout the sheet.

PICK: (1) The phenomenon of pulp or fibers pulling away and sticking to the paper machine parts they come in contact with, such as rolls, in the wet end and dry end sections. (2) A paper mill control test to determine surface adhesion properties of paper. (3) The small particles of paper which loosen from the surface of paper, especially during printing.

PITCH CONTENT: The amount of pitch in pulp, paper or paperboard. Pitch is a resinous substance that is a combination of unsaponifiable organic chemicals mixed with resin or fatty acids, and exists in mechanical and unbleached chemical pulps.

PLY BOND STRENGTH: Refers to the ability of layers or plies of paperboard to adhere together and not separate or delaminate. Normally, there are two plies formed and "bonded" together during formation (multiple headboxes and sometimes multiple forming wires) on the paper machine.

POROSITY: That property of paper and paperboard related to the ability of fluids to pass through them. It is an indication of the size, shape, and distribution orientation of the pores in a sheet and the compactness of the fibers.

PRINTABILITY: The ease with which paper can be printed to high quality standards with the least amount of spoilage.

REFLECTANCE: The light-repelling ability of the paper surface, also referred to as gloss, and expressed as the ratio of the intensity of the light repelled to that repelled from a standard reference.

RUNABILITY: (1) In the paper mill, it refers to how well pulp stock furnish to the paper machine forms a sheet on the wire and passes through the drying and finishing operations. (2) Used by customers in reference to how well the paper performs in their converting operations, such as on printing presses.

SHIVE: Uncooked or undisintegrated bundles of fibers or splinters in woodpulp that may show up as imperfections in the finished sheet of paper made from it, if not previously removed. It is also found in groundwood pulp. Sometimes called slivers.

SHOW-THROUGH: The resistance of a paper sheet to transmission of both diffuse and nondiffuse light so that any printing on one side cannot be seen from the other side. *See also* opacity.

SMOOTHNESS: The surface property of a paper sheet related to its degree of uniform flatness and evenness. It is sometimes measured by the rate of flow of air between two or more sheets or between one sheet and a smooth standard surface.

STANDARD CONDITIONS: Unless otherwise specified, it is assumed to be 29.2 in. of mercury and 70°F.

STIFFNESS: That ability of paper or paperboard to withstand bending or crushing forces. Also called rigidity.

STRETCH: The elongation of paper before rupture when tension is applied. It is measured as a percentage of the original length.

STRIKE-THROUGH: Penetration of ink through a sheet of paper so that it shows through on the unprinted side.

SURFACE SCUFF: Also known as scuff resistance. The ability of paper and paperboard to withstand the lifting of fiber when rubbed on another surface. It is measured by a laboratory instrument consisting of an element of fixed weight and size and rotates at a fixed speed on one spot of a sample sheet.

SURFACE STRENGTH: The resistance of a paper sheet to the removal of fibers from its surface. It is measured by pulling a series of arbitrary grades of melted and then cooled wax sticks from its surface. The measurement procedure is called a wax pick test.

TACK: The sticky property of paper and paperboard adhesive and gluecoating materials. Also, printing inks.

TEAR STRENGTH: The resistance of a paper sheet to tearing. It is usually measured by the force required to tear a strip under standardized conditions. Tear factor is the tearing force divided by the basis weight in grams per square meter multipled by 100.

TENSILE STRENGTH: The resistant property of a sheet to pull or stress produced by tension. It is expressed as force per unit width of a sample tested to the point of rupture.

THICKNESS: The dimension of a sheet of paper or paperboard usually measured between the two surfaces under specifically stated conditions and expressed in thousandths of an inch as its caliper.

UNIFORMITY: The sameness of certain quality, character, or property of pulp, paper, or paperboard, such as brightness, strength, color, finish, distribution of fibers, formation, etc.

WATER DROP TEST: A test used on folding boxboard to measure the degree of sizing.

WATER REPELLENCY: The resistance of paper and paperboard to wetting by water. It is the ability of these products to hold water. Water absorption is the amount of water absorbed in a given time by one side of a unit area of paper or paperboard placed horizontally under a head of 1 cm of water (Cobb test).

WET RUB: The ability of wet paper to withstand the lifting of fibers or scuffing when rubbed by or on another surface.

WET STRENGTH: The tensile strength of a sheet of paper when completely wet; sometimes calculated as a percentage of its dry strength.

WRINKLE: Paper defects appearing as puckers or creases, caused during its manufacture. The defect would be called wet wrinkle if produced while the sheet is wet, usually at the wet end of the paper machine, and dry wrinkle if produced while the sheet is dry, usually at the dry end of the paper machine.

Z-DIRECTION STRENGTH: The strength of paper and paperboard as related to the force and measured by means of tension applied perpendicularly to the test sample surfaces.

ZERO SPAN TENSILE TEST: A test sometimes made on paper to indicate the amount of sheet strength due to fiber binding.

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THE TAX REFORM ACT OF 1986: BOON OR BANE FOR THE PAPER INDUSTRY?

While the new tax law may widen cyclical swings in earnings, it shouldn't significantly affect long-term capital investment

By EVADNA S. LYNN

On balance, Merrill Lynch Capital Markets believes the Tax Reform Act of 1986 will have a relatively neutral effect on the paper industry. After the 1987 transition year, tax reform shouldn't significantly hurt the reported earnings of the major forest products and paper companies. The effect on cash flow is likely to be greater, but it will probably be less detrimental than originally indicated by many industry executives. The new Tax Reform Act's effect on capital investment and prices is likely to be nominal, with business cycle swings continuing to play a greater role than taxes in investment and price trends.

MAJOR NEW PROVISIONS. The Tax Reform Act has three major provisions affecting reported book earnings for the forest industry:

- The drop in the basic corporation ordinary income tax rate from 46% to 40% in 1987 (for companies on a calendar fiscal year) and to 34% in 1988.
- The elimination of timber capital gain treatment. Beginning in 1987, the tax rate on capital gains will be 34%. Because of the lower tax rates on ordinary income, capital gains treatment provides the equivalent of only one-third the previous tax shelter during 1987 and no tax shelter in 1988 or afterward. Capital gains terminology, however, has been preserved.
- The elimination of investment tax credits, retroactive to Jan. 1, 1986. Certain investments, however, qualify for those credits if they are completed during 1986, and a small number of companies have credits on future projects that have been "grandfathered" into the tax new law.

In addition, cash flow will be affected by two further provisions:

- Changes in depreciation provisions that tend to elongate the period over which an asset can be depreciated. This is partially offset, however, by a change in the initial rate of accelerated depreciation, and it shouldn't have a significant effect on tax liabilities.
- The minimum tax provision that provides for a 20% tax rate and includes half of the excess of pretax book income over tax income as a tax preference item. The impact of this provision varies from company to company, but it would normally have a meaningful effect on tax liabilities only during the trough year(s) of a cyclical downturn in the paper or wood products industry. On balance, it will accentuate cyclical swings in industry earnings.
- Other changes in the tax law are likely to have only a nominal effect on book or cash earnings of the forest products companies.

4% GAIN/4% DROP. Our analysis of the effect of tax reform on the major forest products and paper companies leads us to the conclusion that the new tax law will be less of an influence on tax rates in the industry than will the general health of the industry. A theoretical analysis, using stable pretax income for the industry, would indicate a four percentage point increase in 1987 effective tax rates over 1986, but a comparable four percentage point decrease in 1988, back to the old 1986 level. Building in the higher pretax income that we expect as a result of price improvement and cost reduction during that period, however, suggests that the drop in effective tax rates will be even greater for 1988. Effective taxes will tend to grow at a significantly slower rate under the new tax law because the extra income will be taxed at the new marginal rate of 34% rather than the old 46% rate.

Recent and projected tax rates for the three categories of companies in the industry are listed in the accompanying table. These estimates assume a 53% increase in pretax income during 1987 and a 12% gain for 1988 for the 27 companies covered by Merrill Lynch.

The table illustrates the benefits that the old tax law provided the industry during periods such as 1985, when pricing was weak (either from the dollar's strength as in 1985 or from a business recession) and investment spending remained high. That kind of experience, with its much lower effective tax rate, would be essentially

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eliminated under the minimum tax provisions of the new law. Therefore, the risks that have been associated with low-return investments have increased.

> *Increased fear of "hostile raids" has stimulated a management environment that places prime emphasis on improving returns on investment (and equity.)*

CANCELLED TAX CREDITS. In talking with company managements, we initially were concerned about the possible effect on capital spending of investment disincentive caused by the recision of investment tax credits. More recent conversations, however, have minimized that concern for four reasons:

1. The effect may be much smaller than originally anticipated unless the economy faces a deep recession in the next few years. In general, industry management expects cash flow to decline only about one-quarter the magnitude originally projected, or within a margin of approximately 10% of cash flow projected under the old tax law.

2. The recovery in cash flow as a result of higher prices has enabled most companies to fund planned investment in high-return projects that incrementally increase capacity while lowering costs. Although there was a hiatus in new capacity announcements while the tax law was pending, several firms have finalized plans for new capacity in recent months, and other projects are under active consideration. In short, the cash flow will be available, and it will be used.

3. Increased fear of "hostile raids" has stimulated a management environment that places prime emphasis on improving returns on investment (and equity). That influence, more than the tax law, is likely to limit investment in "greenfield" facilities and generate a higher level of expenditures for high-return projects such as debottlenecking, rebuilding and converting existing machines, and adding new machines at currently developed sites.

4. The reduction of deferred tax accounts based on a 46% tax rate will not only free-up future cash flow, but when transferred to the equity accounts (probably late in 1987), will reduce debt/capital ratios and will enable companies to support a higher level of debt for investment. (For the 28 companies that are included in our coverage, that freed-up equity could be as much as $1.4 billion.)

In a way, the new law will be a positive force for investment because it should result in less distortion of investment decisions based on the amounts of tax benefits that such investments could generate. Managements (and boards of directors) will have less margin for error in their forecasts of future economic and product trends underlying investment decisions. Thus, there will be a tendency to approve high-return incremental capacity investments faster than the higher-risk, large "greenfield" projects, although the latter will be approved when returns are available.

NO CAPACITY SQUEEZE. In our opinion, whether or not the new tax law will result in higher industry prices is a moot point. We believe that "good projects" will continue to be built and that cash-flow will be directed primarily toward the expansion of capacity; even "upgraded" production provides an expansion of capacity in the higher-value product. Since incremental capacity investments generally require far less investment per ton of new capacity than greenfield investments, we may actually see more capacity come onstream under the new tax law than would be the case if more funds had been directed toward high-cost greenfield capacity. Similarly, there will be incentive to reduce the cost of greenfield capacity, both through streamlined design and construction and through the use of new technology. Thus, we do not expect a tax-induced capacity "squeeze" that will cause a surge in paper prices. Price levels will continue to be determined primarily by changes in the economic cycle that create more significant swings in the supply/demand balance than those generated by relatively minor capacity changes. ■

TABLE 1: **Recent and projected tax rates.**

Kind of company	Effective 1985	Tax rate on book earnings 1986	1987e	1988e
17 commodity paper companies	23.4%	41.7%	43.0%	37.8%
4 consumer paper companies	39.7	41.6	42.1	36.5
7 forest products companies	27.2	36.8	43.0	38.5
28 company composite	**26.6%**	**40.0%**	**42.8%**	**37.9%**

Source: Merrill Lynch Capital Markets.
e — Estimate.

PULP & PAPER

May 1987

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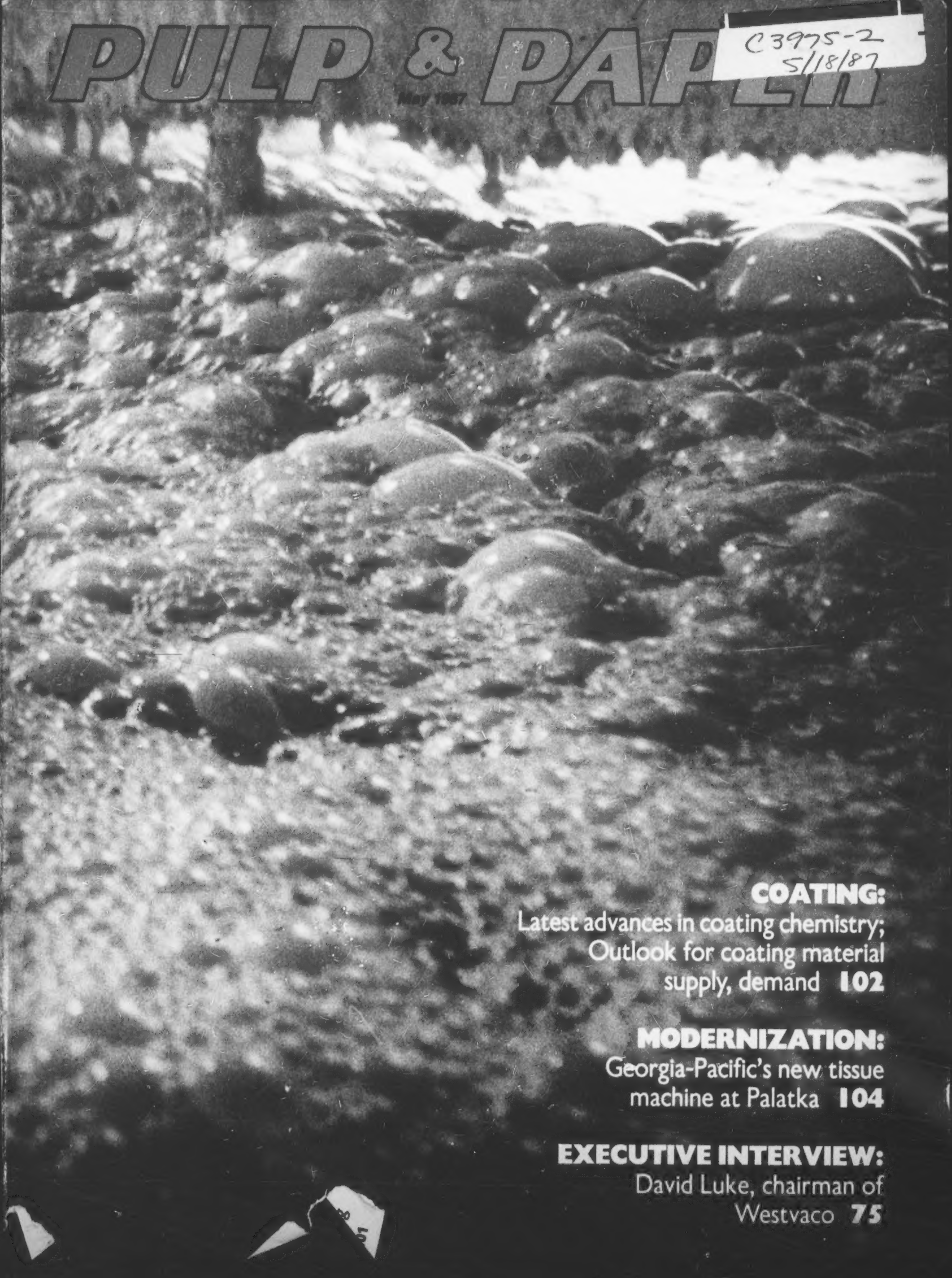

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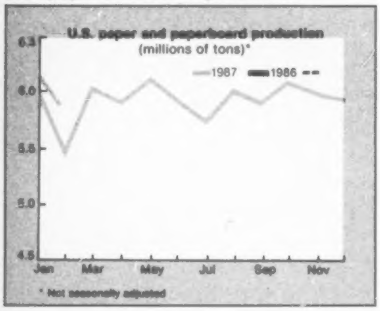
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 5.8 million tons in February, up 5.6% compared with the same month last year, according to the American Paper Institute. On an annualized basis, paperboard output was up 6.6% for the month—almost twice the 3.6% gain registered by the paper grades. The seasonally adjusted trend rate for total paper and board stood at 73.3 million tpy, up 3.2% compared with the record set in 1986 and 5.1% above its year-earlier rate.

Among major grades, coated paper benefited from strong commercial printing demand, rising 8.4% compared with last year, but the larger uncoated free-sheet sector showed only a 2.3% gain. The paperboard grades were all strong, led by semichemical medium's gain of 8.8%. Unbleached kraft board increased 6.6%, fueled by continued record fibre box demand.

Canadian newsprint shipments totaled 756,000 tons in February, a gain of 8.6% compared with the same month last year. Operating rates stood unchanged from January at 94%. Canadian pulp mills operated flat out at 101% of capacity in February, with shipments totaling 589,000 tons for the month, unchanged from last year. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Feb.	441	1.6	5,588	3.8
Uncoated groundwood (s)	Feb.	128	12.3	1,572	6.2
Coated paper (s)	Feb.	526	7.6	6,561	8.4
Uncoated free sheet (s)	Feb.	851	5.3	10,417	2.3
Other printing/writing	Feb.	114	2.7	1,377	1.0
Total packaging and other paper (s)	Feb.	410	1.2	5,136	1.5
Tissue	Feb.	414	5.9	5,122	2.5
Total paper	**Feb.**	**2,884**	**4.8**	**35,771**	**3.6**
Unbleached kraft paperboard	Feb.	1,424	7.5	17,821	6.6
Semichemical medium	Feb.	439	5.5	5,520	8.8
Bleached paperboard	Feb.	343	0.6	4,347	4.8
Recycled paperboard	Feb.	681	7.4	8,495	6.1
Total paperboard	**Feb.**	**2,887**	**6.3**	**36,180**	**6.6**
Total U.S. paper and paperboard output	**Feb.**	**5,771**	**5.6**	**71,951**	**5.1**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Jan.	5,082	4.9	60,982	5.0
Market pulp production	Jan.	668	7.4	8,015	7.3
Wastepaper consumption at paper/board mills	Jan.	1,409	−8.6	16,904	−0.5
Pulpwood consumption (cords)	Jan.	8,049	2.1	96,588	2.1
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Feb.	22,704	4.6	47,412[6]	4.5
Containerboard inventories at U.S. box plants and mills	Feb. 1	2,311	−7.2		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Jan.	1,022	9.2	12,270	9.2
Imports of Canadian newsprint	Jan.	735	11.5	8,819[6]	11.5
U.S. paper exports (including products)	Jan.	394	8.8	4,722	8.8
Exports of unbleached kraft linerboard	Jan.	170	9.0	2,041	4.2
Exports of woodpulp	Jan.	355	−3.5	4,259	−3.4
Norscan pulp inventories[4]	Feb. 28	870	−34.6		
Norscan pulp operating rates[4]	Feb.	95%	97%	96%	93%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Feb.	756	8.6	1,506[6]	6.9
Operating rates	Feb.	94%	94%	98%	94%
Inventories held by U.S. consumers	Feb. 28	1,370	−4.7		
Other paper/board shipments	Feb.	507	8.1	1,028	7.8
Woodpulp shipments (export only)	Feb.	589	0.0	1,202	4.3
Operating rates	Feb.	101%	94%	99%	90%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

COATED GROUNDWOOD: Optimism turns sour

Grade structure: Coated groundwood papers contain at least 10% mechanical pulp, with the balance made up of chemical pulp and fillers. About 85% of U.S. coated groundwood production is No. 5 coated, the rest is No. 4. The latter has higher brightness and usually higher basis weights. No. 5 is valued for the lighter basis weights and runability, though some is actually medium weight.

Most coated groundwood is made in the 32- to 50-lb range (25 x 38 in. in reams of 500), although some 30-lb paper is made, and the group can run to 70 lb. End uses include magazines, Sunday newspaper supplements, catalogs, newspaper inserts, directories, books, flyers, and other commercial printing. In the case of lightweight coated (LWC) paper, coat weight may be about 30% of total sheet weight.

Production/capacity: Shipments of coated groundwoods moved upward about 3% in 1986 from a strong 1985, which itself followed a banner 1984. The major growth area was with commercial printers, who received shipments pegged about 14% higher than in 1985. Magazine orders rose fractionally less. Other periodical publishers reduced their paper purchases by about the same amount. Book publishers received more than 5% more coated groundwood paper in 1985 than in the year before.

Major new capacity came online in the second half of 1986, with new machines installed by Bowater Inc. in Catawba, S.C. (197,000 tons), Consolidated Papers Inc. in Wisconsin Rapids, Wis. (180,000 tpy), International Paper Co. in Pine Bluff, Ark. (200,000 tons), and Repap Enterprises Inc. in New Castle, N.B. (200,000 metric tpy). All told, potential groundwood paper capacity rose about 8% in 1986 compared with 1985. Some of that capacity was originally scheduled to come online in 1987.

Outlook: The almost 800,000-tpy of new capacity, along with reduced magazine advertising and other factors, will wreak havoc on coated groundwoods in 1987. Advertising pages fell by 1.4% in 1986 and are likely to remain flat this year, with one major weekly publication reporting 16% fewer pages in January 1987 compared with January 1986.

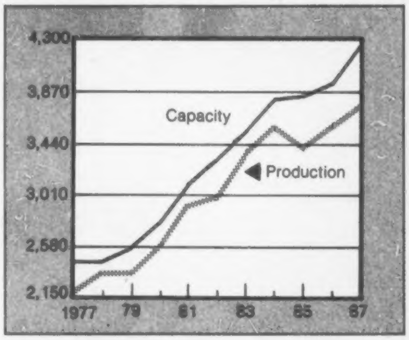
Papermakers may see lower operating rates, possibly below 90%, though, for most, this will merely mean lower profits and not financial ruin. For those producers that rely on market pulp—mostly the smaller, older mills—increasing pulp prices could cut the margin to zero. Some coated groundwood producers may switch to coated free-sheet or uncoated groundwood specialties. No. 5 coated groundwood papers will have the hardest time, while the outlook for No. 4 is uncertain.

Prices: Coated groundwood prices first dropped an average of about 4% at the beginning of 1986, dropping 1986 lists to 1984 levels. At that time, No. 5, 40-lb sold for $798/ton, down $44 from 1984. Unofficial cuts of 3% to 4% hit about mid-year and list eventually dropped to about $761 to $765. Prices remained soft in early 1987 into February when three major paper companies dropped their lists for LWC about 10.6%, which would bring No. 5 40-lb to $680/ton from $761/ton. Transaction prices for this grade reportedly have been as low as, or even below in some cases, $600. Other basis weights dropped by a similar amount in February: 38-lb, 10.5%; 36-lb, 9.4%; 34-lb, 8.5%; and 32-lb, 11.4%. Prices for No. 4 remained essentially unaffected, but it suffered discounts of $40 to $50/ton. Prices are not currently expected to pick up until about mid-1988. Cumulative reductions since LWC's high point in January 1985 are greater than 19% on 40-lb, 17.7% on 38-lb, 16.8% for 36-lb, 15.8% on 34-lb, and 16.5% for 32-lb.

Typical pricing trends ($/short ton for 34-lb roto paper year-end) are: 1980, $735; 1981, $760; 1982, $760; 1983, $782; 1984, $890; 1985, $931; 1986, $860; 1987 (first quarter), $787.

Markets: Slightly more than 60% of all coated No. 5 is used by magazines, another 16% is used by commercial printers, 17% is shipped directly to catalog and directory printers, and the rest is used largely by book publishers. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1985	1986	1987e
Production[1]	3,410	3,553	3,752
Capacity[2]	3,820	3,922	4,264
Utilization rate	89.0%	91.0%	88.0%
Imports	393	401	371
Exports	44	37	37
Apparent U.S. consumption	3,759	3,917	4,086
lb/capita	31.42	32.43	33.51
GNP ratio	1.05	1.07	1.09

e = Estimate

1. *P & P* estimate.

2. American Paper Institute data.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity (000 tons)	Market share (%)
1. Champion	669	15.3
2. Int'l Paper	650	14.8
3. Consolidated	565	12.9
4. Boise Cascade	340	7.7
5. Bowater	302	6.8
6. James River	298	6.8
7. Blandin	280	6.4
8. Mead	270	6.2
9. Pentair	230	5.2
10. Midtec	193	4.4

Market share of top five companies:
57.5

Market share of top ten companies:
86.5

Total U.S. capacity (1987):
4.385 million short tons

Correction. Coated free-sheet production figures were incorrectly reported in the March grade profile forecast chart. The correct figures are: 1985—2,465; 1986—2,707; making utilization rates 86.6% for 1985 and 93.6% for 1986.

NEWSPRINT

Newsprint producers support July 1 hike

North American newsprint companies have continued to announce price hikes for July 1 on both coasts, resulting in nearly unanimous support for the increase. Many companies have slated hikes to $610/metric ton from $570. Companies in the West, though, are planning price hikes to $600 from $570, plus a 2% cut in one of two 5% discounts.

The North American market was robust through March, with a number of newsprint mills reporting running at full capacity. The most recent statistics from the Canadian Pulp & Paper Assn. showed that Canadian mills operated at a 99% rate for February compared with 94% a year earlier. Through the first two months of 1987 the mills ran at 98% compared with 94% for the same period in 1986. At U.S. mills, the operating rate was 97% during February and 94% through the first two months of the year compared with a 94% operating rate both during last February and year-to-date 1986.

Total Canadian shipments were up 8.6% to 756,000 metric tons in February and rose 6.9% to 1.506 million tons for the first two months. Shipments to the U.S. alone rose 3.6% to 541,000 tons in February and 4.8% to 1.095 million tons year-to-date. U.S. newsprint mills' shipments rose 2% to 402,000 tons in February and were up 6.1% to 829,000 tons for the year so far.

Production at Canadian mills rose 5.5% to 766,000 tons in February and was up 4.1% to 1.560 million tons through February. U.S. mills' output rose 1.5% to 400,000 tons in February and increased 3.8% to 845,000 tons for the year-to-date.

Stocks at Canadian newsprint mills grew to 331,000 tons at the end of February, up 2.8% from the previous month but down 12.7% from February 1986. At mills in the U.S., however, stocks fell to 64,600 tons at the end of February, down 3.3% from a month earlier and dropping 28.1% from a year earlier.

Publishers' inventories are holding. Despite signs that the market was extremely firm, publishers indicated that some excess tonnage was still available. CPPA figures showed U.S. consumption was up 1.5% to 894,000 tons in February. At the same time, publishers' stocks stood at 1.370 million tons or 41 days' supply at the end of February, the same as a month earlier but down 4.5% from the 44 days on hand a year ago.

Analysts expect prices to continue to firm through the summer with less discounting by July. One analyst noted that if the price of newsprint continues to rise and supplies tighten, newspapers may decide to use coated paper for Sunday supplements or special sections.

Meanwhile, the movement to increase newsprint prices in the U.K. by 9.6% on June 1 recently got support from domestic producers Consolidated-Bathurst Inc. and Shotton Co. Ltd. This followed earlier announcements by Nordic and Canadian suppliers, which would raise the list price on 48.8-g newsprint to £400/metric ton. The current list price is £365, although transaction levels are 8% to 10% lower.

U.S. newsprint demand has been escalating, while capacity additions have been relatively modest. (Capacity expressed in 000 metric tons.)

Year	U.S. consumption[1]	U.S. capacity[2]	Canadian capacity[3]	Total capacity	Operating rate, U.S. and Canada combined (%)
1984	11,431	5,306	9,820	15,126	92.8
1985	11,587	5,250	9,820	15,070	90.3
1986	11,949	5,315	10,040	15,355	93.7
1987e	12,250	5,368	10,080	15,448	93.4

1. Source: American Newspaper Publishers Assn.
2. Source: American Paper Institute.
3. Source: Canadian Pulp & Paper Assn.

e — Estimate.

■ The **Newspaper Advertising Bureau Inc.** reported that U.S. newspaper advertising spending by retailers in 1986 rose by 6.5% over 1985 levels to $14.3 billion. Of this, advertising by general merchandise and apparel stores rose by 5.2% to $5.4 billion. ■

Southwestern to buy 80% of Gulf Printing

Southwestern Bell Corp. has agreed to acquire an 80% stake in Gulf Printing Co., Houston, Texas, in a stock-for-stock merger with a right-of-first-refusal for the remaining shares. The deal is expected to conclude by the end of May. Gulf Printing is a full service commercial printer, with four plants in Houston, Texas, and Oklahoma City, Okla., and it is one of the top ten directory printers in the country. The company is currently printing 70% of the directories for Southwestern Bell's directory publishing unit.

Southwestern Bell Publications, according to the company's annual report, posted directory advertising revenues of $824 million in 1986. One of the largest and fastest-growing directory operations, Southwestern Bell Publications publishes approximately 1,100 White and Yellow Pages and other special directories in 46 states and the District of Columbia. ■

Gaspesia plans three-year upgrade of newsprint output

Gaspesia Pulp & Paper Co. plans to spend C$113 million between now and 1990 to modernize its 225,000-metric-tpy newsprint mill in Chandler, Que. Not only will the quality of the newsprint be upgraded, but the capacity will be increased by 10% to 247,000 tpy, the company said.

The project involves the installation of top-wire formers on the Chandler mill's two newsprint machines, as well as the speeding up of one of the machines. Grinder loading operations will be automated, and a fourth barker will be installed in the woodroom and upstream and downstream process. Changes in equipment will

U.S. LINERBOARD INDUSTRY FACING FAVORABLE SUPPLY/DEMAND OUTLOOK

However, competition from wastepaper-based grades and growth of plastic film in kraft paper markets creates some uncertainty

By WILL MIES, Executive News Editor

U.S. kraft linerboard producers will enjoy a favorable supply/demand balance through the remainder of the decade. However, exports will face increasing competition from recycled paperboard grades in many markets, and nontraditional producers such as Portugal, Brazil, and South Africa may capture a major share of future growth in international trade.

Even though profitability is on the upswing, the restructuring of the U.S. unbleached kraft industry will continue. New technologies such as multi-ply forming, high-pressure presses and preprinting will enable producers to reduce costs and increase product quality. The kraft paper market will continue to face strong competition from plastic in the grocery bag and sack market.

These were a few of the themes discussed at the Second International Unbleached Kraft Conference, sponsored by *Pulp & Paper*, at the Waldorf-Astoria Hotel in New York City. Session chairmen were William R. Laidig, chairman, Great Northern Nekoosa Corp.; Richard L. Trueb, president, Interstate Resources Inc.; Daniel J. Hince, general export sales manager, Union Camp Corp.; and James Doughan, senior vice president-bag and kraft paper marketing, Stone Container Corp.

LIMITED GROWTH OF CAPACITY. Copeland Economics Group president, William G. Copeland, projected a favorable containerboard supply/demand outlook through the end of the 1980s, despite the downturn expected this year.

A major reason for the high operating rates expected throughout the decade is limited capacity growth. Unbleached kraft board capacity is expected to grow only 2.3% over the 1987-89 period. According to Copeland, the industry can have more confidence in such projections of tight markets because less kraft paper is available to be swung into linerboard and because there are fewer new mills around which can add incremental capacity at a low cost.

A forecast of future U.S. corrugated container demand based on a detailed analysis of end-use markets was presented by Kenneth E. Lowe, director of Communication & Information Services, a market research firm based in Pleasant Hill, Calif.

He projected total U.S. corrugated box demand would grow 2.2% over the 1986-95 period compared with a 2.7% rate for the 1971-85 period. The highest growth was projected for the important food end use category, which was expected to grow at a 3.3% annual rate over the 1986-95 period compared with a 4.3% per year growth rate over 1971-85.

According to Nickey J. Rudd, vice president, manager-process and project engineering, BE&K Engineering Co., at the then current $320 linerboard list price, a new greenfield mill would not be an attractive investment opportunity. Such a mill (1,200 tpd, costing $360 million) would show a slight loss before tax in its first year of operation.. But at a hypothetical $400/ton price, the mill

TABLE 1: **Return on investment from new 1,200-tpd greenfield linerboard mill with optimistic view of future sales price.**

	First year	**15-year average**
Direct capital cost of facility	$360 mm*	
Capitalized interest during construction	32 mm	
Total capital cost	392 mm	
Direct linerboard manufacturing cost	160/ton	$160/ton
Interest expense	77/ton	40/ton
Corporate overhead expense	10/ton	10/ton
Total cash cost	247/ton	210/ton
Depreciation	50/ton	50/ton
Total cost of product sold	297/ton	260/ton
Selling price	**$400/ton**	**$400/ton**
Less freight cost	30/ton	30/ton
Net price to mill	370/ton	370/ton
Before-tax mill margin	73/ton	110/ton
Before-tax mill margin (today's dollars)		46.2 mm/yr
Tax basis analysis		
Net price to mill	$370/ton	$370/ton
Cash cost of product sold	247/ton	210/ton
Gross margin	123/ton	160/ton
Less depreciation	50/ton	50/ton
Taxable income	73/ton	110/ton
Before-tax return on investment		16.1%
Before-tax return on equity[1]		160.0%
Cash required for debt retirement in 15 yrs		**$ 51/ton**

*Millions.

1. Includes capitalized interest.

would be immediately profitable and would generate a 16% before-tax return on investment over a 15-year period (Table 1).

Cost-effective modernization and optimization, however, is attractive even at current prices. Rudd presented an example in which a 1,400-tpd mill is modernized and expanded to 1,680 tpd through the addition of a recycled fiber line. This project would cost $100 million and would yield an attractive return (35% over 15 years), even at current linerboard prices.

MORE RESTRUCTURING? Is the restructuring in the U.S. unbleached kraft industry over? No, more is on the way, according to H.C. Bowen Smith, managing director of Salomon Brothers Inc. In 1980, the top five U.S. linerboard producers had a combined market share of 34%. By 1986, the figure had risen to 43%, and by 1990 the concentration could reach 51%, he projected.

Among the reasons for this growing concentration have been the aggressive attacks of corporate raiders, the disenchantment of some large diversified companies with returns in the paper industry, increasing concentration on fewer product lines by companies within the paper industry, and dramatic fluctuations in exchange rates that sharply reduced industry profitability in 1985.

Another reason for the merger binge is that companies are finding it cheaper to buy rather than build new mills. Smith estimated that a new 1,000-tpd linerboard mill would cost about $350 million to build. That price works out to $244,000/daily ton—or about three times the cost of recent acquisitions.

Use of financial leverage to expand rapidly in the paper industry through acquisitions was described by James B. Malloy, president and chief operating officer, Jefferson Smurfit Corp. Since 1978, Jefferson Smurfit has grown from $50 million in sales to more than $1 billion in 1986 through a series of acquisitions that have included Alton Box Board Co., Diamond Packaging Corp., 80% of Publishers Paper Co., and 50% of Container Corp. of America.

In making acquisitions, Smurfit tries to find companies from which future cash flow can be maximized to service debt used for the acquisition. Smurfit tries to find companies that have sound assets, that are related to its four core businesses, and that offer some synergies with Smurfit's existing operations. Good market timing is also important, and Smurfit has made many of its acquisitions during industry downturns, when assets can be purchased more cheaply.

Once a company is acquired, Smurfit tries to implement substantial cost savings from improved operation of facilities, increased productivity and reduced administrative expense. The company offers substantial bonuses to managers as part of an incentive program based on improving cash flow. Working capital is managed tightly, on a plant-by-plant basis.

NEW QUALITY REQUIREMENTS. Multi-ply forming permits linerboard manufacturers to achieve improvements in compression strength, offers them the flexibility to use various types of furnishes, and can provide a smoother printing surface, according to Leslie J. Taylor, chief project manager for multi-ply, Beloit Walmsley Ltd. He said that most new linerboard machines that have gone onstream in Europe over the last five years have had multi-ply formers. In the U.S., there has been more caution about going to multi-ply forming because of difficult startups at one or two mills. Nevertheless, Taylor noted that Willamette Industries Inc. has been successfully producing a three-ply sheet at its Albany, Ore., mill.

Preprinted linerboard is a cost-effective way to produce point-of-purchase corrugated packaging as compared with traditional methods of applying graphics to corrugated, according to Laurence C. Schiffenhaus Jr., vice president and national sales manager, Schiffenhaus Industries Inc.. He said there will soon be 17 flexographic preprint presses being operated by 14 companies in North America, including one installation scheduled to start up in late 1987. Present capacity of these printing presses is about 16 billion ft² based on press widths and assumed order mixes. U.S. capacity is about 13.5 billion ft², with another 2.5 billion ft² in Canada.

"This is 6% of the total box market in the U.S., and since at least half of the present 270-billion-ft² box market is made up of corrugated that will never be converted to preprint, present capacity could accommodate about 10% of the potential market for high-quality graphics." Schiffenhaus said he was confident based on what he has seen in the market so far that "this capacity will be sold within the next five years."

WASTEPAPER USE GROWING. Future prospects for increasing the use of old corrugated containers (OCC) in manufacturing containerboard was discussed by Fred D. Iannazzi, president of Andover International Associates. He analyzed the economics of producing linerboard at three different facilities: a 1,000-tpd kraft linerboard mill using 100% virgin fiber, a 450-tpd recycled linerboard mill, and a kraft linerboard mill which had been expanded by 200 tpd to 1,200 tpd using OCC.

The analysis assumes a cost for woodfiber in the Southeast for the two kraft linerboard mills of $62/cord. Wastepaper cost for the midwestern recycled mill was based on a cost of $76/ton for OCC.

Based on this analysis, the 80/20 blend mill has a

TABLE 2: **Comparative cost of producing linerboard from kraft pulp, wastepaper and a furnish blend.**

	Case 1	Case 2	Case 3
Fiber furnish	100% kraft	100% OCC	80/20 blend
Raw materials	103	109	104
Conversion	100	108	79
Capital-related	35	22	36
Cost of sales	50	31	49
Total delivered cost	**288**	**270**	**268**

Source: Andover International Associates.

slightly lower delivered cost ($268/ton) than the other mills, based mainly on its higher throughput (Table 2). High-pressure presses have become an accepted technological innovation in the paper industry, with more than 40 installed worldwide, mainly for linerboard production, according to Michael J. Ducey, technical editor, *Pulp & Paper*. High-impulse presses make use of higher than usual linear press loadings, typically 1,100 to 2,000 pli or greater, combined with double felting and a nip width of 3 to 3.5 in.

Machine speed increases are the main reason for installing such presses, but steam savings and improvements in product quality are additional factors. Some linerboard machines in the U.S. have been able to increase machine speed up to 12%, with the average falling between 8% and 10%. Since 1980 about a dozen high-pressure presses have added around 525,000 tpy to U.S. linerboard capacity.

WORLD MARKET OUTLOOK. World containerboard demand will rise from 49 million tons in 1985 to 58.4 million tons in 1990, says Rodney L. Young, vice president, Resource Information Systems Inc. (RISI).

However, kraftliner is not expected to grow at quite the same pace as total world containerboard demand over the next five years. Kraftliner's share of the total containerboard demand is projected to decline from 43.3% in 1985 to 42.1% in 1990 due to big increases in worldwide recycled containerboard capacity. Depressed wastepaper prices will keep the cost of recycled containerboard competitive with kraftliner, even in the U.S. market, according to Young.

Nevertheless, kraftliner mills will operate at relatively high levels thanks to limited capacity expansion, particularly in the U.S. World kraftliner operating rates are forecast to rise from 89.1% in 1985 to a peak of 93% in 1989 before declining to 90.3% in 1990, which is expected to be a recession year (Tables 3 and 4).

Although Swedish and U.S. producers will remain the largest exporters of kraft linerboard, "nontraditional producers are going to take the lion's share of trade expansion over the next four years," Young noted. RISI expects the Nordic and North American share of world exports to drop from 85% in the mid-1970s down to only 70% by 1991. This reflects the competitive cost advantage of such low-wood-cost countries as Brazil, Portugal and South Africa (Table 5).

NO KRAFTLINER GROWTH IN EUROPE. Even though European corrugated box shipments may rise about 3% in 1987, demand for kraftliner may decline because of increased use of testliner and some reduction of box plant inventories built up last year, according to an analysis by Jan Carlström, director of Scanpapp.

He estimated that inventories at European box plants rose about 150,000 metric tons last year. At the same time, some erosion of kraftliner's market share is believed to have taken place because of a substantial widening of the price differential between kraft and testliner—as much as 40% last fall—after the breakdown of wastepaper prices in Europe.

At the same time, European kraftliner mills will be adding about 300,000 metric tpy of incremental capacity over the 1986-89 period. This will result in agrowth rate of 3.4%/year—more than double the rate of the preceding five years. In addition, testliner capacity will be

TABLE 3: **World containerboard summary (000 metric tons).**

	1975	1980	1985	1990
Demand				
Containerboard	31.0	42.4	49.0	58.4
Kraftliner	14.4	19.3	21.2	24.6
Kraftliner share (%)	46.3	45.5	43.3	42.1
Capacity				
Containerboard	42.5	47.9	55.9	66.0
Operating rate (%)	73.0	88.3	87.6	88.5
Kraftliner	19.1	20.8	23.8	27.3
Operating rate (%)	75.3	92.5	89.1	90.3

TABLE 4: **Regional containerboard and kraftliner demand summary (000 metric tons).**

	1973	1985	1991
North America			
Containerboard	16.0	19.5	22.6
Kraftliner	10.5	12.8	14.5
Kraftliner share	65.6	65.7	64.4
Western Europe			
Containerboard	8.4	10.6	12.1
Kraftliner	2.6	2.9	3.2
Kraftliner share	31.2	27.0	26.5
Japan			
Containerboard	5.1	5.8	6.6
Kraftliner	1.5	1.7	2.0
Kraftliner share	29.6	29.5	31.0
Other Asia			
Containerboard	1.8	5.8	8.6
Kraftliner	0.3	0.8	1.1
Kraftliner share	15.2	13.0	13.0
Other regions			
Containerboard	4.2	7.3	9.2
Kraftliner	1.8	3.1	3.9
Kraftliner share	43.5	42.3	42.5

TABLE 5: **Production costs for selected regions (variable costs delivered to western Europe, U.S.$/metric tons).**

	1975	1980	1985	1990
U.S. South	$174	$275	$277	$305
Sweden	270	357	267	373
Brazil	220	294	209	265

Source: Resource Information Services Inc. (RISI).

growing about 3%/year over the same period, with rebuilds and reactivation of some machines.

Kraftliner imports must therefore reduce in 1987, or European operating rates will be under pressure.

Nordic linerboard mills are adopting a number of strategies to remain competitive, such as reducing the amount of wood needed to produce a ton of linerboard, concentrating on lightweight linerboard, reducing production and distribution costs, and switching to value-added products such as white-top linerboard, according to Folke Burstrand, president, SCA Nordliner AB.

The Canadian linerboard industry has undergone considerable change over the past decade, said Albert Lacroix, manager-trade sections, Canadian Pulp & Paper Assn. Although kraft linerboard capacity has remained relatively flat at 1.2 million metric tons over the past decade, the structure of the industry has changed dramatically. Three linerboard mills (two producing kraft) have shut down, removing some 400,000 tpy of capacity. Canadian capacity now stands at 900,000 tons. The second development was the emergence of recycled linerboard capacity, which currently totals 300,000 tons—25% of total capacity.

KRAFT PAPER AT CROSSROADS. The U.S. kraft paper business today is one of contrasts, noted Albert R. Russell, general sales manager, kraft paper and bleached board, Georgia-Pacific Corp. Although alternative packaging is growing, mills operate with full order books.

The "apparent" decline in the kraft paper industry began in 1974 when shipments peaked at slightly more than 4.0 million tons. Since then, unbleached kraft paper shipments have declined to about 3.3 million tons.

However, the real decline in kraft paper shipments began earlier, particularly in wrapping and merchandise bag papers. Multiwall paper shipments have remained relatively flat over the past 15 years at close to 800,000 tpy but have been losing ground in relation to general economic activity. Grocery bag and sack paper shipments, however, have shown steady growth and total more than 2.0 million tons.

Rising polyethylene prices may slow down the rate of plastic substitution in the grocery sack market, but not dramatically, according to Robert J. Bauman, associate director, Chem Systems Inc.

The polyethylene industry is emerging from a five-year downcycle caused by oversupply. Factors that contributed to this situation included substantial capacity expansion in linear low-density polyethylene resin and major polyethylene expansions in Canada and Saudi Arabia. But by late last year, polyethylene industry operating rates were over 90% of capacity and prices appear likely to rise at a rapid rate over the 1987-88 period.

Higher polyethylene costs should result in higher converted plastic sack prices since polyethylene represents about 50% to 60% of the total cost of a finished sack. But a number of other factors will also affect whether higher PE costs will help the competitive position of kraft paper. These include: (1) the volume of low-cost imported plastic sacks entering the U.S., currently estimated at anywere from 20% to 35% of the total market; (2) whether domestic plastic sack manufacturers price competitively to gain future market share; and (3) whether additional kraft paper producers decide to withdraw capacity.

BATTLE AT THE CHECKSTAND. There have been many forecasts that plastic bags would have about 40% of the grocery sack market by the end of the 1980s, actual penetration has been much less, noted Sam Posner, vice president-retail sales of Stone Container Corp.

In 1986, the U.S. paper industry shipped 2.2 million tons of grocery bag and sack paper—the same tonnage level as in 1981. Because supermarket sales have increased over that period, the American Paper Institute estimates that paper today has 85% of the market compared with 100% five years ago.

There are a number of reasons plastic didn't capture the larger market share that some predicted. One reason was that use of the plastic sacks required more in-store training by supermarket chains, which feared the transition would cause a slowdown at their checkout counters. Stores were also afraid of antagonizing consumers, who generally prefer paper sacks.

Another reason was that oversupply from late 1984 all through 1985 kept kraft sack prices equal to higher-quality plastic T-shirt sacks. This virtually "stopped plastic penetration in its tracks" but was "financially damaging to the industry," according to Posner. Poor profitability caused companies to withdraw approximately 500,000 tpy of production from the market. This left "the industry in the position where, unless there is a switch to more plastic, the remaining paper suppliers won't be able to satisfy the demand." Posner said he did not expect the kraft paper sack to go the way of the "dinosaur and the buggy whip." Rather, paper sacks would be used by supermarket chains along with plastic bags to maximize checkout counter speed and efficiency.

A different vision of the future of the grocery sack market was presented by Ron Schmieder, marketing manager-grocery sacks, Mobil Chemical Co. He estimated that plastic sacks' share of the grocery market had grown from 5% in 1982 to 39% in 1986. And he predicted plastics would capture 52% by 1988 and 63% by 1990.

Schmieder said that a number of factors have helped plastic expand its market share. Most important, he said, has been new resin development in the last three years, which has allowed the industry to downgauge its product without sacrificing functionality. ■

Complete proceedings of the conference, Unbleached Kraft Markets II, are available for $167 per copy from the Pulp & Paper *Book Dept., 500 Howard St., San Francisco, Calif. 94105. Ph. (415) 397-1881.*

GROWTH IN COATED PAPER CAPACITY SHOULD REMAIN STRONG THROUGH 1989

After starting up four new paper machines last year, groundwood producers are having trouble handling all of the new capacity

By CARL ESPE, News Editor

Fueled by strong demand from magazine publishers and commercial printers, coated paper has been the fastest growing grade segment in the U.S. paper industry in recent years. According to American Paper Institute data, capacity for coated groundwood paper grew an average of 5.5% a year from 1977 through 1986, while coated free-sheet capacity grew 4.4% a year. In contrast, total paper and paperboard capacity grew at an annual rate of only 2.1% over the same period.

Coated capacity will grow even faster over the next three years, according to API, particularly for free-sheet paper. API expects growth to average 5.9% a year for coated groundwood paper and 6.3% for coated free-sheet for the 1987-89 period. Total paper and paperboard growth, on the other hand, will slow to just 1.8% a year.

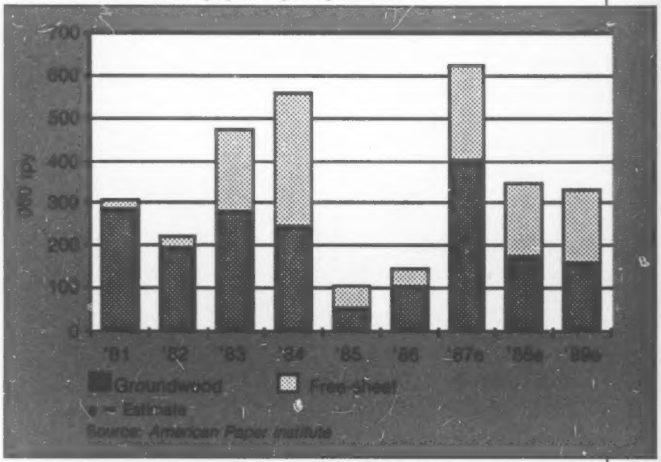
A BUMPY ROAD. While average growth has been high, Figure 1 illustrates that the actual pattern of coated-paper capacity additions hasn't always been smooth. Coated groundwood capacity took off at the start of the decade, rising 8.1% in 1980 and another 10.3% in 1981, and continued strong through 1984. St. Regis Corp., Weyerhaeuser Co. and Mead Corp. brought new coated groundwood paper machines online in 1982, adding some 545,000 tpy to capacity. Despite the 1982 recession, demand was strong enough during this period to absorb the new capacity without too much trouble.

The pattern was somewhat different for the free-sheet grades, where anemic growth became the rule throughout the late 1970s and early 1980s. New paper machines were installed by Boise Cascade Corp. in 1981 and Scott Paper Co. in 1982, however, and capacity took off in 1983 and 1984, rising 8.8% and 12.9%, respectively.

After these big buildups, groundwood and free-sheet capacity growth pulled back abruptly. Groundwood additions fell to a below-average increase of 1.4% in 1985; free-sheet dropped to 1.9% in 1985 and 1.7% in 1986.

GROUNDWOOD GLUT. In 1987, big capacity increases are back with a vengeance, particularly in the ground-

FIGURE 1: **U.S. coated paper capacity additions.**



Source: *American Paper Institute*

TABLE 1: **New coated paper and paperboard machine installations, 1981-88.**

Year	Company, mill	Capacity added (000 short tpy)
	Coated groundwood paper	
1982	**Mead**, Escanaba, Mich.	200
1982	**St. Regis**, Sartell, Minn.	170
1982	**Weyerhaeuser**, Columbus, Miss.	175
1986	**Bowater Carolina**, Catawba, S.C.	197
1986	**Consolidated/Biron Div.**, Wisconsin Rapids, Wis.	180
1986	**International Paper**, Pine Bluff, Ark.	200
1986	**Repap/Miramichi**, Newcastle, N.B.	220
	Coated free-sheet paper	
1981	**Boise Cascade**, Rumford, Maine	169
1982	**Scott Paper/S.D. Warren**, Skowhegan, Maine	200
1988	**Scott Paper/S.D. Warren**, Skowhegan, Maine	215
1988	**Potlatch**, Cloquet, Minn.	n.a.
	Coated bleached paperboard	
1988	**Westvaco**, Covington, Va.	175

n.a. = Not available.

wood sector. During the last half of 1986, four new coated groundwood machines with the capacity for almost 800,000 tpy were started up in North America by Bowater Carolina Co., Consolidated Papers Inc., International Paper Co., and Repap Enterprises Inc. of Canada. As a result, U.S. capacity will rise a record 402,000 tpy in 1987, up 10.2% from 1986 (not counting the new Canadian machine, which will also contribute to U.S. supplies). In contrast to five years ago, the market has so far been unable to digest the new capacity, and producers have had to lower prices and scramble for business this year despite continued healthy demand for groundwood papers. Luckily for groundwood producers, no new machines and few capacity-expanding rebuilds are currently in the works, and capacity increases should slow to a relatively calm 4.0% in 1988 and 3.5% in 1989.

TABLE 2: **Coated paper and paperboard modernization projects and capacity added (000 short tpy).**

Projects completed in 1986	Capacity added
Crown Zellerbach, St. Francisville, La. Rebuild of No. 2 coated groundwood paper machine	30
Dunn Paper, Port Huron, Mich. Added coater to No. 3 machine to produce coated lightweight specialty packaging papers	n.a.
Federal Paper Board, Riegelwood, N.C. Rebuild of coater on No. 15 bleached board machine to improve quality, add some capacity	n.a.
Gulf States Paper, Demopolis, Ala. Bleached board machine rebuild; included two new coaters	20
Mead, Chillicothe, Ohio Rebuild of coater on No. 10 carbonless paper machine	35
Union Camp, Franklin, Va. Rebuild of No. 1 coated bleached board machine	n.a.
Projects scheduled for completion in 1987 and later	
Appleton Papers, West Carrollton, Ohio Convert No. 3 machine from carbonless basestock to coated carbonless	n.a.
Champion International, Bucksport, Maine Rebuild No. 4 groundwood machine and convert to LWC; scheduled for completion in 1989	33
Consolidated Papers/Rapids Div., Wisconsin Rapids, Wis. Rebuild No. 14 coated free-sheet machine and install new coater	10
Mead, Escanaba, Mich. Modernize No. 3 LWC machine and on-machine coaters	n.a.
Midtec Paper, Kimberly, Wis. Rebuild off-machine coater at free-sheet mill	n.a.
Pentair/NOWP, Niagara, Wis. Rebuild No. 1 LWC machine and off-machine coater	12
Jefferson Smurfit, Middletown, Ohio Rebuild recycled boxboard machine, includes new two-stage clay coater	n.a.
Westvaco, Luke, Md. Complete five-year improvement program adding 30,000 tpy to coated free-sheet capacity each year from 1984 to 1988	150

n.a. — Not available.

The current situation for free-sheet is similar in that capacity will jump a sharp 7.9% this year, mostly due to the completion in 1986 of Scott Paper's new free-sheet machine at Skowhegan, Maine. Thanks to strong demand from annual report printers, however, free-sheet business hasn't fallen off as it has in the groundwood sector. Capacity growth will remain relatively strong in 1988 and 1989, rising 5.7% and 5.3%, respectively. Potlatch Corp. is scheduled to start up a new free-sheet machine next year, and Westvaco Corp. will complete a multi-year expansion at its Luke, Md., mill.

PROJECTS UNDER STUDY. Most producers would likely prefer some breathing room before more new capacity is announced, but there are several projects being considered that could be approved and brought online by the end of the decade. Among the most likely candidates, Champion International Corp. is studying a coated free-sheet machine for its Quinnesec, Mich., market bleached kraft pulp mill. A 500- to 600-tpd uncoated machine was proposed for the mill in 1984, but that project was shelved after Champion bought St. Regis later that year. Rust International is participating in the current study. Also in the free-sheet sector, International Paper proposed a new 150,000-tpy paper machine in 1985, but no recent activity on this project has been reported.

One project that could be reactivated is Blandin Paper Co.'s proposal for a new 204,000-tpy coated groundwood unit at its Grand Rapids, Minn., mill. This project, which was postponed twice due to financing problems, could be a beneficiary of the recent purchase of Blandin's parent company, British Columbia Forest Products Ltd., by Fletcher Challenge of New Zealand. Another currently inactive project is Makin Pulp & Paper Ltd.'s plan for a 135,000-tpy coated and uncoated groundwood paper mill to be built in Britannia Beach, B.C.

PAPERBOARD EXPANSION. The largest recent project in coated paperboard was the completion of a 175,000-tpy coated solid bleached sulfate machine at Westvaco's Covington, Va., mill last year. Another area of activity is coated unbleached kraft board, where Manville Forest Products Corp. has been modernizing its West Monroe, La., mill for the past several years. Capacity of the mill will increase 200,000 tpy to 840,000 tons by the end of this year. Finally, Mead is studying a possible 400,000-tpy expansion of coated unbleached kraft paperboard capacity, with a decision expected by year's end. ■

PAPER INDUSTRY RIDING A WAVE, BUT TRADE WOES STILL CAUSE CONCERN

Strong markets spark optimism at API Paper Week, but sharper competitive skills are needed to stay afloat in international markets

P&P STAFF REPORT

Strong business conditions spread a spirit of optimism over the American Paper Institute's 110th annual Paper Week meeting, Mar. 8-11, in New York City. But even though the recovery has been fueled by a resurgence in export demand, the issue of U.S. paper industry competitiveness in international markets remained a source of concern for some speakers.

The U.S. paper industry has done better than most "smokestack industries" in preparing itself to compete in world markets by vigorously controlling costs, noted API chairman Burnell Roberts, who is chairman and CEO of Mead Corp. Nevertheless, he noted that the industry's success in world markets also depended on "fair and free" international trade.

While agreeing that the U.S. paper industry is probably the only basic industry in our country that is cost-competitive in the markets of the world, David L. Luke, chairman and CEO of Westvaco Co., warned U.S. producers against becoming too complacent.

For example, he noted that the U.S. for a long time has had a big jump on other countries because of its abundant forests. However, pine trees can grow at least twice as fast in Brazil, and the growth rate of Brazilian eucalyptus far outstrips that of U.S. hardwoods. Luke cautioned that the U.S. cannot depend on research to get it out of this bind since the levels of both academic and governmental forestry research in the South have declined by about 25% since the mid-1970s. For process development, U.S. paper companies have relied heavily on suppliers and engineering firms, which can transfer the new technology to overseas competitors.

NO REASON FOR COMPLACENCY. What is needed, Luke said, is more product innovation. He observed that many of the U.S. industry's major commodity products, such as containerboard, newsprint, and many uncoated white papers, differ very little from products offered 50 years ago. Such complacency is dangerous because "without a steady flow of innovation, it becomes relatively easy for low-cost suppliers from other parts of the world to strike right at the American market with high expectation of success."

Luke noted that no U.S. producer "has successfully achieved all of the major product characteristics that the users in at least one country [presumably Japan] have available to them from their own domestic sources." He urged U.S. producers to meet the quality levels demanded by overseas customers, who generally want to import products comparable to what they can buy in their own markets.

The same scenario is being played in the high-value printing/writing paper field, where many of the imports into the U.S. are aimed toward the very top-quality categories. "I would say that a year or so ago the characteristics of the higher-quality imported offerings were not equaled by more than one or two out of a full range of potential U.S. suppliers," Luke said. He encouraged U.S. producers to keep up a steady pace of innovation. If not, he warned, "the present flow of uncoated white paper from Brazil into the U.S. is a perfect example of what will happen in our other commodity markets."

API VIEW ON CANADIAN TRADE TALKS. Irene W. Meister, vice president-international of API, stated API's position on U.S. free trade negotiations with Canada: "First, we want total removal of tariffs in both countries on all paper and paperboard products rather than a formula reduction of existing tariffs." She noted that the formula approach will not correct trade imbalances because so many Canadian products already enter the U.S. duty-free and "you cannot apply formula cuts to zero tariffs—zero is zero."

Second, API is concerned with Canada's policy of subsidizing the increased capacity that "unquestionably will be directed toward the U.S.," noting that the Canadian market cannot absorb this new capacity. About 90% of Canadian paper and board exports enter the U.S. duty-free, while only 30% of U.S. exports have duty-free status in Canada. This is largely due to the fact that the U.S. imports large amounts of pulp, newsprint, and uncoated printing paper, all of which are duty-free. Dr. Meister encouraged the two governments to solve the tariff problem at upcoming negotiation sessions, while conceding the fact that dealing with the U.S. Congress and Canada's provincial and federal governments will pose some hurdles.

Attending a luncheon during API's annual Paper Week held in New York City were (*left to right*) Burnell R. Roberts, chairman of API and chairman and CEO, Mead Corp., along with William Safire, Pulitzer Prize-winning journalist, and Red Cavaney, president of API.

MAKING PULP. U.S. and Canadian producers of market pulp are facing increasing international competition from countries such as Brazil, Spain and Portugal, noted Ronald J. Slinn, vice president of API's Pulp Materials & Technology Group.

The increasing cost of entry into the market pulp business might slow the emergence of some of these new competitors. Building an optimally sized greenfield mill in the U.S. currently costs between $600 and $800 million—or more than $600,000 per daily metric ton of capacity. However, the cost of doubling the capacity at the Aracruz market pulp mill in Brazil from 500,000 tons to 1 million tons could exceed $1 billion—or more than $700,000 per daily ton.

The introduction of the Brazilian type of eucalyptus pulps in 1978 was a major new product development for market pulp. "The combination of favorable climatic conditions and innovative tree breeding has currently made it possible for some Brazilian eucalyptus producers to offer pulps in which the fibers will be customized to their client's individual papermaking requirements and grown in as few as seven years," the API executive commented.

One of the few major technological innovations in pulp manufacturing in recent years has been the development of thermomechanical pulp (TMP) and chemithermomechanical pulp (CTMP) in the Nordic countries, primarily as a way to get more usable fiber from their more costly wood. North American producers have followed the lead of Nordic producers but "it remains to be seen whether the alphabet pulps are indeed suited to the unique individual requirements of a broad range of market pulp consumers," Slinn cautioned.

Slinn estimated that the Canadians will be experimenting with some 750,000 metric tpy of new CTMP capacity over the next several years. The generally accepted view is that CTMP is better suited to an integrated operation, where it can be customized to the end product, he noted.

The decline of the dollar against many (but not all) foreign currencies over the past 24 months has dramatically strengthened the competitive position of North American market pulp producers over their Nordic rivals. This was reflected in capacity utilization rates last year of 100% for the U.S. and 92% for Canada, in sharp contrast to only 83% for Sweden and 86% for Finland. Meanwhile, producers in other countries whose currencies are more closely linked to the U.S. dollar were also able to run full-out in 1986: 98% for Brazil, 105% for Portugal, and 107% for Spain.

"Of course, the flip side of this aspect of the international pulp market is the buying power of consumers in countries where currencies have recently strengthened significantly against the U.S. dollar," Slinn said. The most dramatic example is Japan, where pulp imports from the U.S. jumped 32% in 1986 from the previous year, while the domestic Japanese market pulp industry ran at only 74% of capacity. U.S. pulp consumers have had to absorb the full impact of the recent pulp market upturn since they have not received any benefit from the exchange rate.

Slinn said that the pulp market began 1987 "with somewhat reduced but nevertheless robust vigor." Producers' inventories were near rock-bottom levels and consumers' inventories were only marginally above normal. "Even modest real economic growth in the countries comprising the world's major pulp markets this year and next would generate sufficient additional demand to confirm whether or not there is indeed slack market pulp capacity in the Nordic countries.

"Sustained demand over the remainder of this decade, combined with the prospect of a total increase of less than 2% in world chemical paper-grade market pulp capacity over the next two years, could encourage some minor league pulp suppliers to become bigger contenders in the future," the API executive said. Two of those countries which are likely to come from behind in the future are South Africa and Chile. And New Zealand is another.

FURTHER GROWTH FOR WASTEPAPER. Results from the first two months of 1987 indicate that the growth trend in U.S. wastepaper consumption should continue through 1987, according to J. Rodney Edwards, vice president-paperboard of API. Last year, collections of recyclable paper in the U.S. rose 7% to about 21.6 million short tons, with both domestic and export consumption reaching record levels.

Domestic consumption in 1986 was about 18 million tons, and over 3.7 million tons of paperstock were exported. This trend continued in January and February, with recycled paper and paperboard mills operating at "close to practical maximum capacity" while continuing to increase utilization of wastepaper, Edwards noted.

He said the upward momentum is likely to continue this year, which will "put pressure on the collection system to expand in order to meet increasing demand. The paper recycling industry will be challenged in 1987 more than ever before, and the challenge will be to maintain the balance between supply and demand," said Edwards.

For 1986, total collections of corrugated totaled 10.2 million tons, up 10.8% from 1985. The collection rate was about 45%, with the collection system expanded substantially last year to meet the rise in demand. Of the total collected, about 2 million tons were box plant clippings and 8.2 million tons were old corrugated containers (OCC).

Consumption of old newspapers for cellulosic insulation, molded egg cartons and cushioning materials for packaging may be higher than previous estimates, noted API. Total collections rose 4% to 3.9 million tons in 1986 from the previous year.

Mixed paper collections dropped 4.7% to 2.7 million tons last year, primarily due to shifts to old news and OCC by export customers because of the increasing amount of plastics, metals and other nonfibrous materials found in mixed papers.

Collections of high grades and pulp substitutes in 1986 rose 8.5% to 4.8 million tons, reflecting the rise in yield of clippings from converting facilities such as those making envelopes, business forms, and printed brochures. Also, mills were increasing their consumption of substitutes for higher-priced market pulp, noted Edwards.

"OTHER USES" PACE NEWSPRINT. Total newsprint consumption in the U.S. was up 3% in 1986 compared with a year earlier, the fourth consecutive annual increase, according to the API. The largest growth in end use, however, was not in daily newspapers but in other uses. While dailies consumed 2.3% more newsprint last year than in 1985, usage for purposes "other than daily newspapers" was 5.2% higher.

U.S. and Canadian newsprint shipments to the U.S. increased by only 1.7%, however, due largely to the fact that end users increased their inventories in 1985 and reduced them to an even greater extent in 1986, according to James L. Hutchison, API vice president-paper group.

Imports to the U.S. from overseas decreased 9.6% to 301,400 metric tons in 1986 compared with the prior year's 333,500 tons. The major suppliers were Sweden (134,700 tons) and Norway (80,400 tons). U.S. exports, however, rose 21% to 337,000 tons from 279,000 tons in 1985. This shift was attributed primarily to the sharp drop in the value of the U.S. dollar relative to the Swedish krona and Norweigan krone.

North American newsprint capacity shows relatively little change in the 1984 to 1988 period, with tonnage rising to just 15.6 million tons from 15.1 million tons. On the demand side, however, newsprint mills could experience some slippage in orders from newspapers if circulation drops as some suspect it might.

The increase in daily newspaper circulation over the past 26 years was attributed to the increase in the number of households as the nation experienced a large infusion of household-forming adults. However, the num-

TABLE 1: **U.S. wastepaper consumption and exports for 1985 and 1986 show growth trend which has continued in 1987.**

1986 wastepaper data
(short tons)

	Consumption at U.S. paper and paperboard mills*	Exports	Total collected
News	3,143,011	766,087	3,909,098
Corrugated	8,682,115	1,529,772	10,211,837
Mixed	2,028,129	693,697	2,721,826
High grades	4,034,488	759,205	4,793,693
Total	**17,887,743**	**3,748,711**	**21,636,454**

1985 wastepaper data

	Consumption at U.S. paper and paperboard mills*	Exports	Total collected
News	3,174,989	625,631	3,800,620
Corrugated	7,899,441	1,310,876	9,210,317
Mixed	1,901,502	879,825	2,781,327
High grades	3,874,123	469,594	4,343,717
Total	**16,850,055**	**3,285,926**	**20,135,981**

* Includes consumption at plants making molded pulp and insulation products. Source: American Paper Institute.

TABLE 2: **U.S. newsprint consumption activities for 1984-86 and U.S. and Canadian shipping activities in 1985-86.**

U.S. consumption of newsprint
(000 metric tons)

	1984	1985	1986	% change 1986-85
Daily newspapers	8,532	8,725	8,926	2.3
Other uses	2,899	2,862	3,010	5.2
Total	**11,431**	**11,587**	**11,936**	**3.0**

U.S. and Canadian shipments to major regions

	1985	1986	% change
North	2,764	2,889	4.5
South	3,952	3,548	−1.2
West	2,383	2,513	5.5

ber of people reaching household-forming age will be in a steady downward trend over the next decade, noted Hutchison.

DOLLAR BOTTOMING OUT? Although widely viewed as a "nonevent," the February meeting of leading finance ministers and central bank governors probably succeeded in helping stabilize the dollar around present levels, according to Dimitri Balatsos, director of global investment strategy for Kidder Peabody International Investments Ltd. This was mainly due to the fact that the meeting was well timed with "growing market perceptions that the dollar's slide has generally bottomed out."

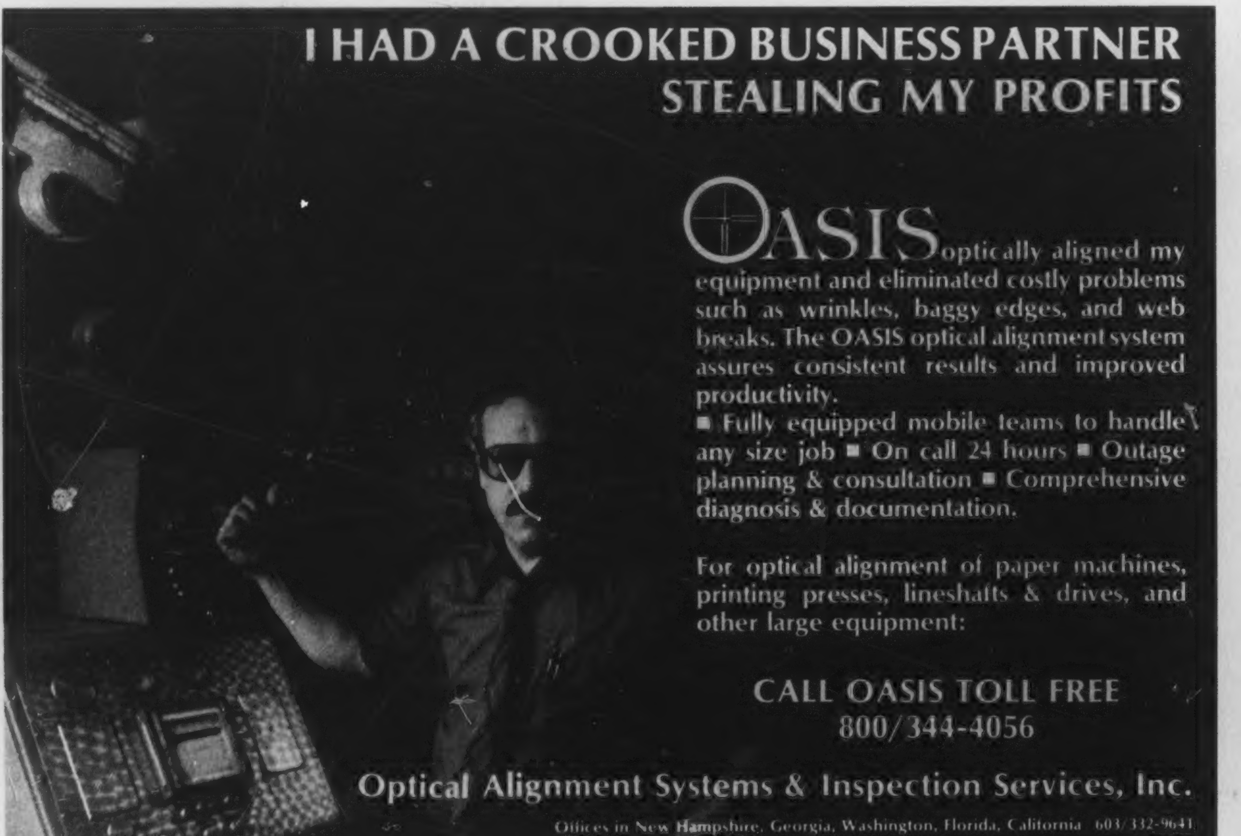
In addition, the outlook suggests that the U.S. economy will accelerate significantly later this year, while the West German economy is weakening. Large pools of surplus savings exist in Japan and Germany for export to the U.S., where assets appear cheap. As a result of this, Balatsos predicted a slight weakening of the yen to DM190 to 195 by next September and then a strengthening back to the current level of DM175 to 180 by March of 1988. The yen might weaken to ¥160 in relation to the dollar by this September however return to ¥140 next March. ■

API names '86 Safety Award winners

The American Paper Institute presented awards to seven companies during its 110th annual Paper Week meeting in recognition of their outstanding safety records. The winners had the lowest accident and injury records over the past five years for their respective size classifications, based on OSHA statistics. In addition, their total incidence rate for 1986 must not have been higher than during the previous year, and the mills must not have experienced a fatality or permanent or total disability over the past five years.

In the area of primary operations the winners were: Weyerhaeuser Co., Plymouth, N.C.; Potlatch Corp., Lewiston, Idaho; Buckeye Cellulose Corp., C & S Div., Memphis, Tenn.; Buckeye Cellulose Corp., Flint River Plant, Oglethorpe, Ga.; and Procter & Gamble Co., Oxnard, Calif.

The winners in the area of converting operations were: Procter & Gamble Co., Cape Girardeau, Mo.; Procter & Gamble Co., Greenville, N.C.; Manville Forest Products Corp., Carton Plant, West Monroe, La.; Union Camp Corp., Sheet Finishing Dept., Franklin, Va.; along with Boise Cascade Corp., Pajco Products, Lowville, N.Y.



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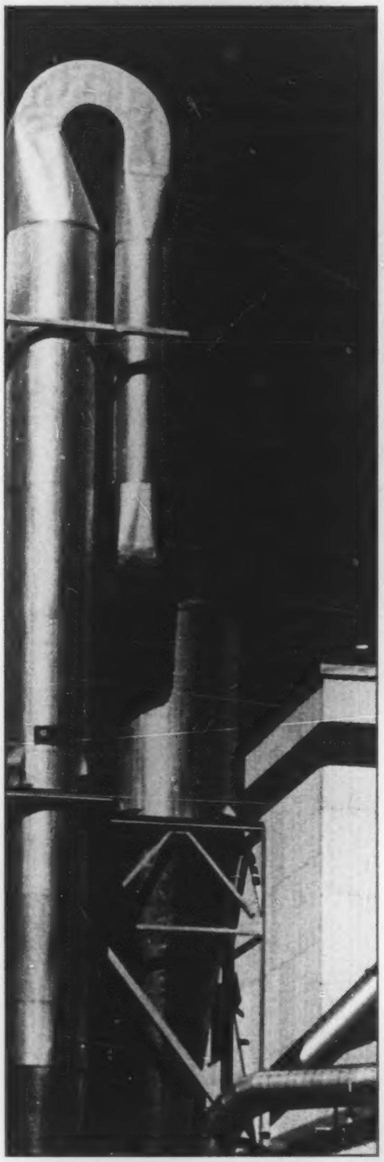

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Pulp from Temcell's new bleached CTMP mill at Temiscaming, Que., is marketed for use in a wide variety of tissue and paper grades. **(Photo courtesy of Communications DG4/G. Wells.)**

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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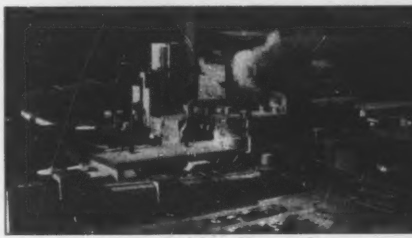

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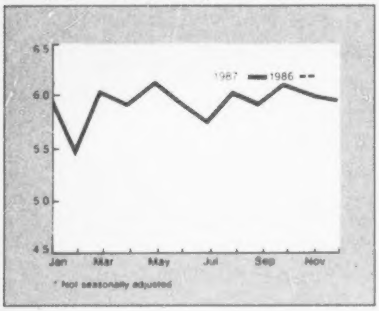
Rockhammars, Rottneros merge
Congo exporting eucalyptus to Europe
Norske Skog orders TMP line
NZFP to spend $145 million
K-C Australia orders tissue machine
Hylte to go ahead with news machine
Venezuela studying news mill

MONTH IN STATISTICS

U.S. paper and board production



* Not seasonally adjusted

U.S. production of paper and paperboard totaled 6.3 million tons in March, up 4.7% from the comparable month last year, according to the American Paper Institute. On a seasonally adjusted basis, production during the first quarter reached an annualized pace of almost 72.5 million tpy. That performance is 4.5% better than the same period last year and represents capacity utilization of 95%, API reported. First-quarter paper output was a seasonally adjusted 35.8 million tpy, up 2.9% from last year, while paperboard averaged a 36.7-million-tpy rate for the period, for an operating rate of 97%.

Among major grades, coated paper continued to lead the way, with production up 8.9% compared with last year. Containerboard production for domestic use continued to benefit from record box shipments, rising 7.3% during the first quarter, API said. Unbleached kraft lineboard production for export was down 2.9% compared to last year, however, although actual exports of liner remain well above depressed year-earlier levels.

Canadian newsprint shipments climbed 12.2% in March compared with the previous year, as mills operated at 100% of capacity compared with only 89% in March 1986. Woodpulp exports fared well also, with shipments rising 5.9% and operating rates climbing to 97%, up from 87% last year. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Mar.	475	−2.9	5,624	1.4
Uncoated groundwood (s)	Mar.	134	8.1	1,586	6.1
Coated paper (s)	Mar	553	9.7	6,586	8.9
Uncoated free sheet (s)	Mar.	923	1.0	10,638	2.0
Other printing/writing	Mar.	120	−5.5	1,393	4.0
Total packaging and other paper (s)	Mar.	444	−0.4	5,191	0.7
Tissue	Mar.	435	0.9	5,153	1.4
Total paper	**Mar.**	**3,083**	**1.6**	**36,170**	**2.9**
Unbleached kraft paperboard	Mar.	1,559	6.1	18,118	5.8
Semichemical medium	Mar.	491	12.1	5,645	8.8
Bleached paperboard	Mar.	390	3.2	4,458	4.2
Recycled paperboard	Mar.	754	11.7	8,710	6.6
Total paperboard	**Mar.**	**3,194**	**7.9**	**36,897**	**6.1**
Total U.S. paper and paperboard output	**Mar.**	**6,278**	**4.7**	**73,067**	**4.5**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Feb.	4,622	4.9	58,224	5.0
Market pulp production	Feb.	595	1.0	7,574	4.1
Wastepaper consumption at paper/board mills	Feb.	1,380	7.2	16,869	2.7
Pulpwood consumption (cords)	Feb.	7,541	3.9	93,540	3.0
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Mar.	24,755	10.3	72,167[6]	5.0
Containerboard inventories at U.S. box plants and mills	Mar. 1	2,391	−3.9		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Feb.	970	0.7	12,242	7.4
Imports of Canadian newsprint	Feb.	673	−14.7	8,694[6]	6.2
U.S. paper exports (including products)	Feb.	415	18.9	4,950	16.1
Exports of unbleached kraft linerboard	Feb.	205	55.3	2,264	31.0
Exports of woodpulp	Feb.	372	8.8	4,068	−4.4
Norscan pulp inventories[4]	Mar. 31	867	−23.5		
Norscan pulp operating rates[4]	Mar.	99%	100%	97%	98%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Mar.	846	12.2	2,352[6]	8.7
Operating rates	Mar.	100%	89%	99%	92%
Inventories held by U.S. consumers	Mar. 31	1,364	−2.9		
Other paper/board shipments	Mar.	549	11.1	1,579	8.7
Woodpulp shipments (export only)	Mar.	792	5.9	1,993	4.9
Operating rates	Mar.	97%	87%	98%	89%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

CORRUGATING MEDIUM: High operating rates continue in 1987 with rising prices

Grade structure: Corrugating medium, the middle fluting material used in corrugated containers, is made from both semichemical pulp and recycled fiber. In 1986, 78% of corrugating medium was made from semichemical furnish (which normally contains at least 20% recycled fiber) and 22% was "bogus" medium made from wastepaper. Basis weights of corrugating medium are 22, 26, 33, 36, and 40 lb/1,000 ft².

Standard sheet weight is 26 lb, which accounts for more than 80% of production. Recycled medium for equivalent uses is normally produced in slightly higher weights.

Production/capacity: Production of corrugating medium rose 7.3% in 1986 to 6.9 million tons from the previous year. This reflected a 6.9% jump in U.S. corrugated box shipments.

Semichemical medium output rose 5.6% in 1986 to 5.37 million tons, while recycled medium production jumped 14.1% to 1.55 million tons.

This resulted in an extremely high 97.2% operating rate for semichemical medium and a 100.6% rate for recycled medium. (The high operating rate figures indicate that official industry capacity estimates may be understated.)

Outlook: The outlook for corrugating medium this year and beyond is fairly bright. For the first quarter of 1987, total corrugating medium production was running more than 8% above a year ago.

For all of 1987, however, medium output is expected to be up 3.7% to 7.2 million tons. This is based on 3% growth in U.S. corrugated box shipments and a slight rise in board inventories. Corrugated box shipments have been outpacing real GNP growth and industrial production, which are both expected to rise 2.5% in 1987, according to the consensus of economists surveyed by *Blue Chip Economic Indicators*.

No new semichemical medium machines have been announced in the U.S.; and capacity is only expected to rise 0.5% in 1987 and 0.7% in 1988. Part of the reason for this slow growth is Willamette Industries Inc.'s plan to convert a 260-tpd semichemical medium machine to linerboard production in mid-1987. Recycled medium capacity is expected to show somewhat faster growth, rising 7.5% in 1987 and 3.1% in 1988. Chesapeake Corp. converted a linerboard machine to produce 325 tpd of recycled medium at the end of 1986.

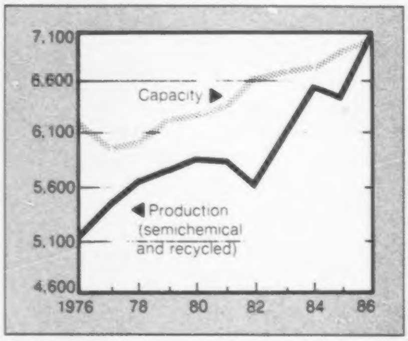
The U.S. containerboard industry has been undergoing a major period of consolidation. The expected sale of Owens-Illinois Inc.'s Forest Products Div. (No. 2 medium producer) could significantly change capacity rankings in this grade.

Prices: Corrugating medium prices have been rising along with linerboard, although the differential between the two grades has increased. Semichemical medium list prices rose to $340/short ton in the eastern U.S. in January, although transaction prices in some sections of the country range from $310 to $330. Linerboard has been firm at $350 (before zone discounts). In recent years, a $10/ton price differential has existed between the two grades.

Among the reasons for the larger than normal price gap are lower manufacturing costs for medium, shorter shipping distances from many northern mills, availability of wastepaper-based board of varying quality, and low-priced imports from Canada and Mexico. Although gaps with linerboard may persist, medium prices are expected to rise by about $30/ton in the fall of 1987.

Price history at year-end for 26-lb semichemical medium in the eastern U.S. is as follows: 1980, $260; 1981, $290/$260; 1982, $240; 1983, $280; 1984, $310; 1985, $240; 1986, $320*; mid-1987, $350* (asterisks indicate discounting off list prices).

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1984	1985	1986e
Production[1]			
Semichemical	5,088	5,373	5,550
Recycled	1,359	1,551	1,630
Total	**6,447**	**6,924**	**7,180**
Capacity[1]			
Semichemical	5,411	5,528	5,557
Recycled	1,523	1,541	1,658
Utilization rates (%)			
Semichemical	94.0	97.2	99.9
Recycled	89.2	100.6	98.3
Imports[2]	65	99	115
Exports[1]	189	212	220
Apparent U.S. consumption			
000 tons	6,323	6,811	7,705
lb/capita	53.4	56.4	58.0
GNP ratio	1.76	1.85	1.88

1. American Paper Institute data.
2. Dept. of Commerce data.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity			Market share (%)
	Semi-chem	Recycled medium	Total	
1. Stone	651	169	821	11.4
2. O-I	670	—	670	9.3
3. Weyco	630	—	630	8.7
4. Inland	190	250	440	6.1
5. Smurfit[1]	90	285	375	5.2
6. Mead	345	—	345	4.8
7. IP	340	—	340	4.7
8. Va. Fibre	260	—	260	3.6
9. PCA	260	—	260	3.6
10. Willamette[2]	130	120	250	3.5

Market share of top five companies: **40.7%**
Market share of top ten companies: **60.9%**
Total U.S capacity (1986):
7.215 million short tons

1. Includes 58% interest in Container Corp. of America (115,000 tpy semichemical; 165,000 tpy recycled) and 33% of Groveton Paper Board (100,000 tpy semichemical).
2. Reflects conversion of semichemical machine at Albany, Ore. (90,000 tpy) to linerboard in mid-1987.

SALES & EARNINGS

U.S. paper industry profits nearly double

The U.S. paper industry started 1987 off with a bang: first-quarter earnings rose 91.2% on increased sales of 23.3% compared with first-quarter earnings in 1986. Producers of market pulp, linerboard, and newsprint—commodity products which are in a favorable worldwide demand/supply balance—are cleaning up because of the weak dollar. Things are not going as well for nonintegrated mills and coated paper producers.

International Paper Co. more than tripled its earnings, although the quarter included a $14-million pretax gain from the sale of IP's stock holdings in Southwest Forest Industries Inc. John A. Georges, chairman and CEO, commented, "Our containerboard and pulp markets continue to do well, and lumber prices improved during the first quarter. Uncoated free-sheet markets have experienced competitive price pressures due to industry capacity increases, and, as expected, the coated papers business continues to be weak due to overcapacity and a continuing influx of imports."

James River Corp., which just ended its third quarter with earnings 144% above year-earlier levels, said that price improvements in communications papers and market pulp and "favorable results from all acquired Crown Zellerbach Corp. operations" more than offset competition in its folding carton and specialty papers segments.

Champion International Corp. attributed its 152% earnings improvement to "generally better market conditions, a sharp increase in wood products earnings, and continuing improvements in productivity." The company noted that a Jan. 1 price increase on uncoated paper was nixed when capacity from three new machines entered the market. Income from its paper group during the first quarter was approximately $9 million below fourth-quarter 1986.

Pulp, lumber producers prosper. Weyerhaeuser Co.'s earnings rose 104% from first-quarter 1985. George H. Weyerhaeuser, president and CEO, attributed the showing to "strengthening markets aided by the weakened dollar and improved manufacturing efficiencies, with most facilities operating at or near capacity." Weyco said it will "continue expansion through internal growth and acquisition," expecting good conditions into 1988.

Earnings at Georgia-Pacific Corp. increased 167% in the first quarter. Chairman and CEO T. Marshall Hahn Jr. noted, "Our pulp and paper division posted all-time operating profits of $82 million in the quarter, driven in part by continued favorable currency exchange rates."

Louisiana-Pacific Corp. had the highest quarterly sales in its history, while earnings rose considerably. L-P said its building products plants and its pulp mills operated near capacity. The company's Waferwood Div. had record sales during the quarter. In the second quarter of 1987, L-P will begin operating two new Waferwood plants in New Waverly, Texas, and Dawson Creek, B.C., bringing the company's annual production capacity to 2 billion bd ft/year.

U.S. paper/forest products industry first-quarter sales and earnings results.

	First quarter ($000)			
Companies	**Sales**	**Change 1987/86**	**Earnings[1]**	**Change 1987/86**
Boise Cascade	$912,220	0.36%	$40,150	60.6%
Bowater Inc.	282,931	41.4	11,813[2]	64.7
Champion Intl.	1,097,223	−2.24	55,468	152.1
Chesapeake Corp.	155,460	16.3	4,232	269.8
Consolidated	174,935	8.2	21,983	−6.2
Federal Paper	229,804	10.6	10,934	353.1
Fort Howard	394,303	23.4	35,107	−5.1
Georgia-Pacific	1,855,000	15.6	80,000[2]	166.6
P. H. Glatfelter	73,493	4.5	12,247	19.0
GN Nekoosa	566,700	16.2	43,300	211.5
International Paper	1,800,000	63.6	90,000[2]	260.0
James River (1/25)	1,057,588	73.8	41,691[2]	144.1
Jefferson Smurfit	255,838	13.6	14,661	279.3
Kimberly-Clark	1,183,200	14.1	75,100	2.6
Longview (1/31)	132,885	30.9	14,065	1,077.0
Louisiana-Pacific	422,900	31.1	16,310	1.099.3
Mead Corp.	957,000	40.3	34,200	68.5
Mosinee Paper	50,645	5.5	945	−61.6
Pentair Inc.	197,797	45.6	3,659	0.44
Pope & Talbot	100,303	35.4	6,651	1,338.0
Potlatch Corp.	248,628	6.6	17,786	30.4
Scott Paper	957,400	19.5	49,000	25.3
Sonoco Products	248,154	9.8	15,289	31.7
Southwest Forest	170,400	19.6	6,700	255.8
Stone Container	585,804	51.2	26,145	653.9
Temple-Inland	390,600	33.4	33,700[2]	147.8
Union Camp	537,018	8.5	44,197	100.5
Wausau (2/28)	60,404	8.3	2,764	8.8
Westvaco (1/31)	440,860	5.9	19,495	−3.8
Weyerhaeuser	1,617,343	23.8	101,917	103.9
Willamette	322,980	18.7	22,947	203.3
Total	**$17,479,821**	**23.3 %**	**$962,456**	**91.2%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.

2. **Bowater:** 1986 quarter includes $6.3-million loss on retirement of assets. **Georgia-Pacific:** 1987 earnings include $6-million pretax gain from stock redemption. **International Paper:** 1987 earnings include pretax gain of $14 million from sales of securities. 1987 figures include **Hammermill Paper Co. James River:** 1987 earnings include $5.2-million gain related to sale of Gaylord Container. **Temple-Inland:** 1986 quarter includes $4.3-million gain on property and equipment.

one among others considered in the same province. Rumors indicate that another company there may add a newsprint machine. Crown Forest Industries Inc. has meanwhile slated a new thermomechanical pulp line for startup by mid-1988, adding 50,000 tpy of capacity.

Aside from tentative and firm projects involving newsprint expansions, various rumors have been circulating about other plans. One report is that another company aside from Ponderay is studying the feasibility of building a newsprint mill in Washington state. On the East Coast, various companies reportedly have investigated sites for a newsprint mill near Arkadelphia, Ark.

According to an Arkadelphia official, several groups have sought information over the past several years about the area's ability to support a paper mill. Since 1978, the city has worked with J.E. Sirrine Co. The engineering firm would not release the name of its client. Bowater Corp. and Kimberly-Clark Corp. were suggested by various sources as likely candidates, but each denied any involvement. International Paper Co. and Weyerhaeuser Co. also own land in the area, it was noted.

The rumor on the Washington state project separate from the Ponderay mill proposal has been just as difficult to confirm. Local sources say the unidentified company is considering sites for a $200-million newsprint mill in Pend Oreille and Grant counties, but has also considered sites in Montana, Alberta, and British Columbia. The consulting firm for the project, International Marketing and Technology Inc., Federal Way, Wash., refused to identify its client.

North American newsprint projects, announced and proposed, 1987-1990

Announced company/mill	**Capacity (metric tpy)**	**Startup**	**Project**
Abitibi-Price	−60,000	1988	Convert No. 10 PM to directory paper
Alma, Que.			
BCFP	n.c.	1988	No. 2 PM rebuild
Crofton, B.C.	n.c.	1989	No. 1 PM rebuild
CIP	60,000	1987	New No. 4 PM replacing old one
Gatineau, Que.			
Crown Forest	50,000	1988	New TMP line
Elk Falls, B.C.			
Donohue	140,000	1987	New PM
Clermont, Que.			
Gaspesia	22,000	1990	Rebuild 2 PMs
Chandler, Que.			
Great Lakes	14,000	1987	No. 4 PM upgrade
Thunder Bay, Ont.	n.c.	1987	No. 3 PM upgrade
	60,000	1991	New PM
Kruger	90,000	1987	No. 2 PM rebuild
Corner Brook, Nfld.	162,000	1988	No. 7 PM rebuild
MacMillan Bloedel	35,000[1]	1987	Conversion of No. 9 PM, pulp expansion
Powell River, B.C.			
Newsprint South	205,000	1989	Proposed new mill
Grenada, Miss.			
Ontario Paper	n.c.	1987	Expansion of deinking pulp mill
Thorold, Ont.			
Smurfit Newsprint			
Newberg, Ore.	n.a.	n.a.	New recycled fiber plant
Oregon City, Ore.	n.a.	n.a.	Nos. 1, 3, 4 upgrade
Soucy	n.c.[2]	1988	No. 2 PM rebuild
Riviere-du-Loup, Que.			
Proposed company/mill			
Bear Island	200,000	n.a.	Proposed new PM
Ashland, Va.			
CIP	225,000	n.a.	New mill
Gold River, B.C.			
Donohue Normick	210,000	n.a.	New PM
Amos, Que.			
GLFP/Ponderay	154,000	n.a.	Proposed new mill
Usk, Wash.			
Finlay Forest	n.a.	n.a.	Proposed new PM next to pulp mill
MacKenzie, B.C.			
Southeast	146,000	n.a.	Proposed second PM, recycled newsprint
Dublin, Ga.			
Undetermined	159,000	n.a.	Proposed new mill, recycled newsprint
Richmond, Calif.			

1. Includes newsprint and groundwood papers.
2. Groundwood paper capacity to be raised 20,000 tpy.
n.c. = No change; n.a. = Not available.

Market observers are concerned about too much new capacity coming onstream in the late 1980s and early 1990s if too many of the proposed projects are approved. The likely result is another downcycle of excess capacity, competitive markets, and low industry profits. Said one skeptic of the industry's traditional way of bringing on new machines, "they're like elephants; they come in herds." ■

FREE-SHEET

G-P approves second machine at Port Hudson

Georgia-Pacific Corp.'s board of directors approved the installation of a new 824-tpd uncoated free-sheet machine at the company's Port Hudson mill in Zachary, La. The machine will cost about $185 million and is slated for completion in the fourth quarter of 1988.

The first machine at the mill, which produces 660 tpd of cut-size, forms, and other offset grades, started up in April 1986 (*P&P*, July 1986, p. 29).

The new machine appears to be the largest printing and writing paper grade machine installed in North America. The first machine, a 378-in.-wide Valmet Sym-Former, was the largest such machine at the time of its installation. But G-P's record was taken away after the conversion of Champion International Corp.'s 380-in. No. 5 machine at Pensacola, Fla., to uncoated free-sheet late last year.

In addition, the company has begun engineering studies to expand the mill's market pulp production, presently 820 tpd, to coincide with the startup of the new machine. In-

Chemicals play increasing role in growth of mechanical pulping

Higher yields, attractive capital and production costs, opportunities in new markets, and other factors are pushing mechanical pulping to the forefront of activity in North America's pulp expansion arena. Chemicals are playing an important role in this recent growth by providing vehicles to make mechanical pulps stronger, brighter, and applicable to new end-use technologies. Consumption of pulping and bleaching additives is expected to jump again this year, while price and supply will move according to product type and source.

There have been fewer project announcements during the past 12 months than during the same period last year, but many of the announced projects came online. In Canada, the most significant startup was in Temiscaming, Que., where a PREX impregnator and a peroxide bleachery are now helping to produce bleached chemimechanical pulp (BCMP) for the market. This pulp will be used for tissue products and printing and writing grades. Three other operating lines (Domtar Inc., Consolidated-Bathurst and Ontario Paper Co.) have achieved successful results with a combination of well-engineered equipment and innovative chemical addition. The chemithermomechanical (CTMP) line in Durango, Mexico is now manufacturing saleable market pulp using pressurized impregnation and peroxide bleaching.

In the past eighteen months, expansion and greenfield mill project announcements have been numerous. New companies that have plans include Fiberco, Makin Pulp & Paper Ltd., Millar Western (all in Canada) and Evco. Existing sites converting to mechanical processes incorporating chemicals in the U.S. include: International Paper Co., Pine Bluff Ark., and Bear Island Paper Co., Ashland Va. And in Canada they include: MacMillan Bloedel Ltd., Powell River, B.C.; and Cascade Inc., Port Cartier, Que. CIP Inc. is installing peroxide bleaching in Trois-Rivieres, Que., for its newsprint products.

Consumption. With all of these projects moving foward, chemicals for pulping and bleaching are being consumed in parallel with the production curve. The chemical garnering most of the success is hydrogen peroxide. With a growing list of reliable suppliers, stability in price and storage, easy installation and application, and a proven background, peroxide has been a steady performer for companies desiring brighter mechanical pulp. At this writing, DuPont's Maitland, Ont., facility was delivering product and Degussa's Mobile, Ala., plant was just starting up. Oxychem Canada, a joint venture of L'Air Liquide and Atochem, is constructing a plant in Becancour, Que., scheduled for startup later this year. Interox and FMC also continue to be strong in the marketplace.

Predictions for consumption of peroxide overall have been closely realized, but the annual rate is on a "roller coaster." Incremental increases were characteristic of the early 1980s, but a boom is likely in the latter half of the decade. Sources conclude that the market for peroxide in North American mechanical pulping operations is currently about 25,000 short tons (100% basis), and should grow at least 5% to 7% through 1990.

The most widely used chemical for mechanical pulp bleaching is sodium hydrosulfite. Consumption of products delivered or generated is more than two times as great as hydrogen peroxide. The three major suppliers of this chemical are Olin, Virginia Chemicals, and Ventron. Each has chosen a different marketing path. Virginia Chemicals offers its V-Brite blend (see article on page 129), and has recently began sales of a 33% suspension of sodium hydrosulfite called Sus-Pen. Prior technology allowed only solutions of 11% and 13%. Ventron is still marketing its on-site generators and Borol solution, while Olin sells commodity product.

Bleaching chemical charges have not changed significantly, although they are influenced by the increasing amounts of sodium sulfite, caustic, and sodium bisulfite used in the pulping process. Bleaching additions are still typically 1% to 2% based on wood, while impregnating chemicals are higher than 2%, (particularly higher if the product is sold as market pulp for consumer tissue or printing and writing grades).

Price. The major chemicals seem to be headed in two directions. Sodium hydrosulfite is getting closer to list, with a firmer market showing strong demand and adequate supply. The list validity of Hydrogen peroxide remains unclear, but no one is apparently anticipating an upward movement in price for any of the shipped concentrations. As new plants come on stream and attain full production, a new list may be established.

—*Michael Ducey*

TABLE 1: **Chemicals used in mechanical pulping operations in North America.**

	1985 Consumption	% Increase	Price[3]
Sodium hydrosulfite[1]	70.000	4.5	0.64
Hydrogen peroxide[2]	25.000	7.0	0.32
Sodium sulfite	40.000	8.0	0.23

1. Courtesy of Virginia Chemicals.
2. Courtesy of E.I. DuPont.
3. List price, USD per lb., *Chemical Marketing Reporter.*

PULP BLEACHING CONCERNS FOCUS ON ClO_2 GENERATION, EFFLUENT CONTROL

P&P's fourth annual survey of bleach plant equipment shows increased interest in chlorine dioxide systems and new technologies

By MICHAEL J. DUCEY, Technical Editor

The recent strength in market pulp and white paper markets has prompted some paper companies to make more long-term commitments to chemical pulp bleaching lines, according to *Pulp & Paper*'s recent survey of mills and suppliers. The survey, currently in its fifth year, also disclosed a growing need for source security as well as a genuine concern for bleach plant effluent reduction.

This article, based on that survey, takes a comprehensive look at the current mill chemical consumption patterns, new supplier products and their markets, the latest developments from a number of North American research institutions, and provides some brief facts on worldwide chemical pulp production and growth over the past 12 months.

With input from some 150 respondents representing a variety of companies, the report covers most aspects of bleaching in the pulp and paper industry. Beginning in 1982 as a mailed questionaire, the study has since developed into a "forum" where suppliers, mills, and researchers can discuss the most current trends and developments for the benefit of all concerned parties. *Pulp & Paper* wishes to thank those individuals who participated in the survey.

As in the past, each participant is provided with a complete annual report on trends in chemical consumption (only summarized in this article). Extra copies of the 1987 report are available on request by writing to: *Pulp & Paper* Bleaching Survey, 500 Howard St., San Francisco, Calif. 94105.

API's production figures should reveal that chemical consumption will be much the same as it was in 1986. Our studies have shown that consumption decreases per bleach line are generally offset by either increased production of an existing line or the installation of a new line. An example of this is the documented decrease of hypochlorite use in mills across North America. Hypo has been cut by as much as 15%, yet the amount of chlorine and caustic may have incrementally moved upward in those areas.

Similarly, chemical mixer installations have been sold on the basis of reducing ClO_2 use. Although quite the opposite has actually happened, particularly in areas where fiber is difficult to bleach, this has allowed more throughput at equal or better quality and uniformity.

The greatest changes in chemical consumption have occurred in addition and substitution. Our study found significant percentage increases in the number of lines employing select chemical addition. In the U.S., oxygen used in the first caustic extraction stage jumped from 7% of all lines in 1983 to 35% in 1987. Chlorination stage ClO_2 rose about 20% in the same period, while hydrogen peroxide enjoyed a growth rate of about 30%. In Canada, nearly 90% of all lines use ClO_2 in the C-stage, 80% use oxidative extraction, and 40% use peroxide.

Further analysis of the survey figures shows even more interesting trends. For example, the actual amount of ClO_2 substitution in the chlorine stage also seems to be increasing. In the U.S. and Canada, twice as many lines are adding more than 10 lb/ton as did in 1983. Softwood chemical pulp production is lending itself to oxidative extraction, and the percent of lines reported above would need to be multiplied by 1.5 if this species were taken into consideration. Our figures for hydrogen peroxide use seem to be somewhat high, perhaps because they include those users who add it on occasion

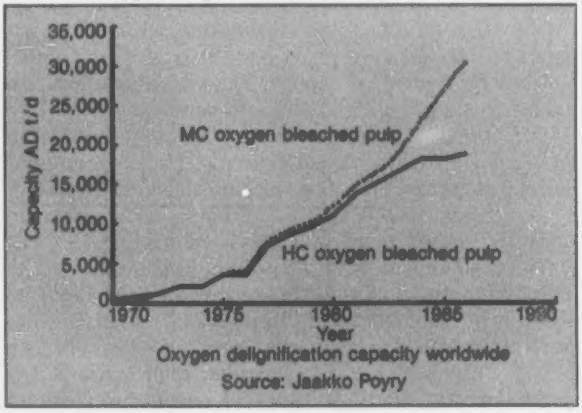
Champion's Pensacola, Fla., mill uses a new three-stage bleaching technique, which offers a variety of advantages.

for export market pulp, special paper grades, and other more selective uses. A more accurate figure for lines dedicated to using hydrogen peroxide would be 25% (total North America). Although it is not reported independently, sulfur dioxide (usually no more than 1 lb/ton) continues to be used as an antichlor enroute to high-density storage.

CAPITAL EXPENDITURES. According to *Pulp & Paper's Project Report*, chemical pulp mill investments reached $298 million last year. The major projects represented in this figure include Champion International Corp.'s Pensacola, Fla., mill, where new oxygen delignification and short sequence bleach plant equipment were installed, and James River Corp.'s Naheola, Ala., mill, where two lines were split into three. Several boiler projects also contributed to the total.

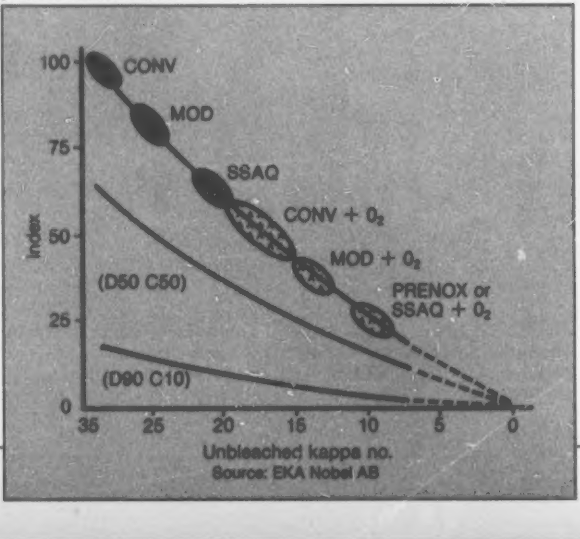
In 1987, capital expenditures are running considerably lower than they were during the previous year. Less than $100 million reportedly will be spent, but that number may double, as orders for equipment to be installed next year are strong. Big ticket items such as dynamic mixers, innovative washers, and supervisory control systems have slowed somewhat since their rapid acceptance in the early 1980s.

FIGURE 1: **Oxygen delignification capacity worldwide.**



Oxygen delignification capacity worldwide
Source: Jaakko Poyry

FIGURE 2: **Bleach effluent TOCl reduction through various process modifications.**



Source: EKA Nobel AB

The larger projects are coming from some of the smaller mills. Two Wisconsin sulfite mills, Great Northern Nekoosa's Nekoosa Papers Inc. and Pentair Inc.'s Flambeau Paper Corp in Park Falls (see article on page 102 of this issue), are making changes in their sequences to incorporate oxygen technology (EO stage) while cutting hypochlorite to chlorine dioxide. Large mills seem to be directing more attention to chlorine dioxide generation, brownstock washing, and stage control that will help reduce chemical consumption in already overloaded bleach lines.

Several new lines are on the drawing boards at North American mills. Although construction announcements have not been forthcoming and technology selection has not been disclosed in all cases, it appears that oxygen delignification and short sequence bleaching are the major choices.

Mill locations mentioned for such upgrades include Lewiston, Idaho, Luke, Md., Eastover, S.C., Eureka, Calif., and Windsor, Ont. Major conversions are planned for Port Hudson, La., Moss Point, Ms., and many locations in the Midwest and Pacific Northwest.

ROAD TO BLEACHING. Considerable activity is being focused on the process area ahead of the bleach plant. Solutions to overworked brownstock washers are being sought, and new technology exploring alternatives to chlorination has come of age internationally. Bleach lines have been the benefactor of new technologies in mixing and controls, but in order to squeeze more pulp through without increased steam, effluent, and chemicals, those vital process steps leading to the bleachery must be closely examined.

In the brownstock washing area, the development and implementation of the horizontal washer has benefited more than 25 mills worldwide. An interesting side note has surfaced on this equipment recently. The two chief suppliers, Black Clawson and Sunds Defibrator, have agreed to offer an exchange of technology for potential buyers. The Black Clawson Chemi-Washer will now be designed to use the perforated steel band used in Sunds' Ultrawasher. The steel band lasts many times longer than the woven fabric (2 to 3 years vs 4 to 12 months), but costs of the unit are nearly $1 million (also meaning that spare parts are expensive).

Mills using these devices report that defoamer addition has been drastically reduced or eliminated, washing efficiency has improved with less chemical and lignin carryover, and more uniform pulp is received for bleaching. The units have also proved themselves in all areas of pulp manufacturing—sulfite, semichemical, kraft (with many in hardwood), and sawdust. Currently, 18 Chemi-Washers (11 in North America) and five Ultrawashers (with several on order) are in operation.

Information on the technology has been published by a number of sources, and operating data is available from the original designers based on experience gained at Georgia-Pacific Corp. (Crossett, Ark., and Bellingham, Wash.) and also from James River (Naheola). For more information on washing, please see the article on page 136 of this issue.

The compaction baffle filter from IMPCO is also gaining wider acceptance. Several orders have been received already this year. The equipment is being used in creative ways in both brownstock and bleach plant washing applications. It should be noted that IMPCO and Sunds Defibrator will soon be announcing new roles in supplying equipment and services to the pulp and paper industry. An agreement between United Paper Mills Ltd. (Finland), Svenska Cellulosa AB (Sweden), and Ingersoll-Rand occurred earlier this year, resulting in a joint venture formed from the equipment and technology supplier arms of each company (Jylhavaara, Sunds Defibrator, and IMPCO, respectively). No public information is available, but it is conceivable that each will have particular process areas in which to concentrate marketing and technology efforts.

Oxygen delignification has also been a hot topic lately, particularly in Europe, where environmental concerns associated with chlorine bleaching have caused debate. An issue closer to home, last year's drought in the southeast, has fueled interest in the process. Two oxygen delignification systems in the U.S. have recently started up, one at Champion in Pensacola and the other at Consolidated Papers Corp. in Wisconsin. Our survey showed that at least three other mills (all on the high end in chemical consumption) are interested in doing the same thing and have plans underway.

Internationally, it appears as if all Swedish mills will have oxygen delignification units in place by 1990, while Japan is a very close second. Brazil's Suzano mill recently announced its intention to construct the largest oxygen delignification line in the world (up to 1,350 tpd). Figure 1 shows the growth of systems worldwide.

Extended delignification in continuous digesters is also seen as an aid to bleaching. Three mills now use the technology, which involves a more even alkali profile combined with partial countercurrent operation, resulting in a 15% viscosity gain and an exit kappa number of 20 to 25. Another technology for prebleaching now being developed on a pilot scale (4 tpd) is the Prenox system, currently running at SCA/Nordliner AB's Ostrand pulp mill in Sweden. The pulp is treated with 1.5% NO_2 for an hour at 60° C and atmospheric pressure in preparation for an oxygen stage. A kappa number of 6 to 10 can be achieved, making bleaching a simple one- or two-step process. The system is environmentally sound.

The Weyerhaeuser Technology Center is maintaining its ozone pilot facility, but no further developments were reported. However, it was disclosed that a joint development project is being finalized. No details were given. Figure 2 shows alternate methods to chlorine-intensive bleaching and their benefits in kappa reduction.

TABLE 1: **Summary of participants.**

U.S.
Mills reporting: 76
Total bleaching lines: 95
Tonnage represented: 17.8 million short tpy
Percent of capacity: 79%

Canada
Mills reporting: 38
Total number of lines: 44
Tonnage represented: 6.8 million short tpy
Percent of capacity: 64%

Geographical breakdown	**Number of lines**
U.S. East	16
U.S. West	28
U.S. Midwest	12
U.S. South	39
Canada East	13
Canada Midwest	8
Canada West	23

	Number of people
Suppliers	43
Researchers	12

CHEMICAL GENERATION. The average age of ClO_2 plants across North America is close to 20 years. Since this is generally the designed lifetime for these facilities, ClO_2 plant overhauls should be a major area of interest through the 1980s. A few mills have already elected to install new or converted systems, including Brunswick Pulp & Paper Co., Bowater Inc., Mead at Kingsport, Tenn., G-P at Palatka, Fla., Domtar Inc. at Windsor, Que., James River at Camas, Wash., British Columbia Forest Products Ltd. at Crofton, B.C., and Western Pulp Ltd. Partnership at Squamish, B.C. Many others have begun trials to test the latest technology (see report on ClO_2 systems on page 61 of this issue).

Suppliers report that, generally, the main interest has been in expanding chlorine dioxide capacity, balancing saltcake, and reducing chlorine and water requirements. The R8 process from Erco has been very popular. This process increases ClO_2 output 50% to 100% from an existing R3 or SVP plant, while eliminating by-product chlorine and reducing saltcake by 40%. Three startups are known to be scheduled for 1987 and two for 1988.

Another popular system is the "L-Process" from Multifibre, which reportedly eliminates as much water as possible from the ClO_2 generating process, recycles acid/water/chlorate back to the generator, produces a sodium acid salt for black liquor recovery, and provides an efficient, safe, and easy-to-operate process at a low chemical, energy, and capital cost.

Onsite chloro-alkali systems have not been sold recently. Systems from Kemanord, MoDo Chemetics, the

HO group, and others are not being installed due to the availability and price of chlorine and caustic.

In recent years, great strides have been made in ozone generation technology. Economical and operational advances in producing this elusive chemical have stirred new interest in ozone bleaching. The more progressive projects are in Japan and Sweden, but several U.S. companies (on the supplier and paper industry sides) have efforts underway that may lead to a capital project soon. Many of the ozone-handling hurdles (particularly its concentration levels, pressure and temperature constraints in reduction, delivery, and application) are close to being overcome.

CONTROL TECHNOLOGY. Dual sensor control for bleaching stages is now being widely used. Although chlorination stage applications are fully saturated, a strong replacement market for this equipment still exists. A real potential for new products appears to be in controlling the latter stages of chlorine dioxide, hypochlorite, and sulfur dioxide (high-density storage).

A new set of sensors from Kajaani offers flow and consistency functions. Last year many mills were reportedly very interested in these new features, as the demand for tighter control of fiber properties and fiber itself continued to increase. The new Kajaani products do not require power in the field (power can be drawn from the equipment room), making installed costs lower and maintenance easier. The devices are designed to operate in a harsh environment and also under "duress," e.g. if one of the functions is lost, the other functions will continue to perform.

Supervisory system sales have been very slow during the past 12 months. This is due partly to saturation without much replacement and partly to the large capital outlays involved. Some sources feel that business may pick up soon for larger systems. Mills apparently have more capital funds available now than in the recent past, and the need to upgrade control capabilities certainly exists. Generally, many mills are controlling bleach stages on a single basis with no overall control scheme developed. One supplier mentioned that such mills seem eager to parlay these "patchwork" situations into fully automated distributed control systems.

CURRENT RESEARCH. In addition to the work on NO_2 and ozone bleaching, considerable fundamental research and some developmental research is focusing on the bleaching of chemical pulp. At the Institute of Paper Chemistry, research on the reaction kinetics of chlorination by PhD candidates is now underway. This work will examine low consistency (in a flow reactor) and high consistency (keying on fluidization) applications in hopes of devising a mathematical model.

At PAPRICAN, the Papricycle process for caustic extraction continues to develop. A way has been found to use this normally discarded alkali source to displace about one-third of the NaOH requirements in the first extraction stage. This procedure recycles the E1-filtrate to rewash the chlorinated pulp, following its normal wash, before it enters the E1 stage. Besides decreasing NaOH consumption, the process is also expected to reduce steam requirements in the extraction stage, since heat from the recycled effluent raises the temperature of the colder chlorinated pulp. Another series of projects is concentrating on modifications to oxygen delignification and oxygen extraction stages. This work will introduce chemical additives such as peroxide to make the stage more efficient in chemical consumption and to assist in brightening the pulp.

In the literature, information on ozone and oxygen combinations is ample and results vary. Sequences such as OZEP, OZED, etc. tested on hardwood species (primarily) can produce a pulp with good viscosity and 85 GE brightness, which is suitable for integrated mills. Research efforts on this concept are being closely guarded as commercial development approaches reality.

FUTURE OUTLOOK. Competing with oxygen delignification is the much-publicized use of high ClO_2 substitution in the chlorination stage. Some of the major oxygen delignification obstacles include recovery limitations, high investment costs, maintenance of pulp quality lack of operational experience, and variable cost differences. Although employing a sequence primarily using ClO_2 cannot achieve the toxicity reduction of oxygen, it could be an incremental step in reducing chlorine consumption and therefore the effluent load exiting the bleach plant. Mills in North America using more than 10% ClO_2 substitution for chlorine include displacement bleacheries, mills in tight water situations, and those now operating short sequences.

Equipment-wise, bleach plants are becoming progressively more sophisticated. Although the market for mixers is somewhat saturated, growth of pumps, washers, and controls will be steady for many years. As a result, fresh steam and power requirements are expected to decrease. A main reason for this is the present and future acceptance of shorter bleaching sequences.

Technologies such as ozone bleaching, Prenox, biological pulping, etc. will need a commercial boost if any of these systems are to be integrated into bleach plant operations worldwide. There will be many more oxygen delignification units in the U.S., Canada, Finland, and wherever environmental concerns may "snowball" as they recently have in Sweden.

P&P's next bleaching survey this summer will ask a variety of mill bleach plant superintendents what alternative would be chosen if discharge levels of certain biologically sensitive material are cut in half. The results will be added to the data on chemical consumption and a forecast of bleaching in the twenty-first century will be presented as part of a report given at the International Pulp Bleaching Conference next year. ■

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PULP & PAPER

July 1987

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...ly 1987 Pulpwood Processing • Power/Steam Vol. 61, No. 7

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper,* is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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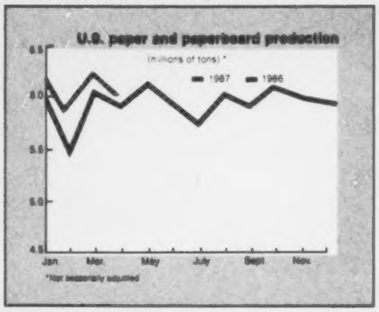
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.0 million tons in April, up 2.7% from the same month last year, according to American Paper Institute data. The seasonally adjusted production trend rate for April stood at 72.4 million tpy, up 4.1% compared with last year but down slightly from the first-quarter rate of 72.5 million tpy. Paperboard continued to show the most strength, with the trend rate running 5.7% ahead of last year's pace. The April trend rate for paper was 2.5% ahead of last year.

Among major grades, a rebound in coated papers led the way in the paper sector. Heavy demand also boosted imports of coated paper 29% compared with 1986, API said, with most of the increase coming from Canada. Heavy containerboard demand was reflected in another record month for fiber box shipments, while folding boxboard production climbed 7.0% above year-earlier levels.

Canadian newsprint shipments in April totaled 818,000 tons, up 2.3% from last year, while the operating rate jumped to 99%. Woodpulp production was off 4.0% compared with last April, although the operating rate climbed to 98% for the month. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Apr.	462.0	2.4	5,605.0	1.7
Uncoated groundwood (s)	Apr.	121.0	−4.7	1,549.0	1.2
Coated paper (s)	Apr.	539.0	5.7	6,547.0	7.9
Uncoated free sheet (s)	Apr.	892.0	4.2	10,575.0	2.7
Other printing/writing	Apr.	112.0	−0.9	1,389.0	−0.3
Total packaging and other paper (s)	Apr.	424.0	-4.3	5,227.0	0.3
Tissue	Apr.	404.0	-4.3	5,076.0	−0.2
Total paper	**Apr.**	**2,960.0**	**1.3**	**35,968.0**	**2.5**
Unbleached kraft paperboard	Apr.	1,368.0	−3.9	16,610.0	5.1
Semichemical medium	Apr.	460.0	3.8	5,614.0	7.5
Bleached paperboard	Apr.	366.0	1.4	4,440.0	3.5
Recycled paperboard	Apr.	741.0	6.3	8,756.0	6.5
Total paperboard	**Apr.**	**3,049.0**	**4.2**	**36,845.0**	**5.7**
Total U.S. paper and paperboard output	**Apr.**	**6,009.0**	**2.7**	**72,813.0**	**4.1**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Mar.	5,031.0	3.9	58,934.0	4.6
Market pulp production	Mar.	686.0	7.9	7,795.0	5.4
Wastepaper consumption at paper/board mills	Mar.	1,380.0	−2.3	17,188.0	3.2
Pulpwood consumption (cords)	Mar.	7,869.0	7.9	93,836.0	3.7
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Apr.	25.591	1.2	97.758[6]	5.0
Containerboard inventories at U.S. box plants and mills	Apr. 1	2,408.0	−4.3		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Mar.	1,063.0	12.5	12,412.0	9.1
Imports of Canadian newsprint	Mar.	728.0	4.3	8,707.0[6]	5.5
U.S. paper exports (including products)	Mar.	427.0	2.6	5,009.0	11.1
Exports of unbleached kraft linerboard	Mar.	187.0	2.2	2,257.0	19.6
Exports of woodpulp	Mar.	471.0	13.8	4,509.0	2.3
Norscan pulp inventories[4]	Apr. 30	913.0	−10.9		
Norscan pulp operating rates[4]	Apr.	101%	99%	100%	99%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Apr.	818.0	2.3	3,169.0[6]	7.0
Operating rates	Apr.	99%	92%	99%	92%
Inventories held by U.S. consumers	Apr. 30	1,371.0	−2.7		
Other paper/board shipments	Apr.	536.0	0.9	2,115.0	6.6
Woodpulp shipments (export only)	Apr.	623.0	−4.0	2,616.0	2.6
Operating rates	Apr.	98%	88%	98%	89%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) — Shipments.

RECYCLED PAPERBOARD: Flat capacity helps market

Grade structure: Recycled paperboard is made primarily from secondary fiber and is produced on either a fourdrinier or multi-ply paper machine. Grades include the following: boxboard, corrugating medium, linerboard, gypsum liner, and core/can/tube stock.

Production/capacity: Production jumped 11.1% to 8.14 million short tons in 1986 from 1985. Demand fell off somewhat at year-end but continued to build through the first quarter of 1987, with recycled folding boxboard production up 8.3% compared with a year earlier.

Capacity increased just 1.7% in 1986 from the previous year, resulting in tightening supply levels as demand shot up more than 6.7%. Mills operated at 91.0% of capacity compared with 86.8% a year earlier. This year, capacity is expected to rise 2.5% to 9.17 million short tons, which should keep mills running at about a 92.7% rate.

Uncertainty over some idled capacity, however, could change this picture within a short period. The Riegelsville, Pa., mill of International Paper Co. and the Clifton, N.J., mill of V. Ponte & Sons have been idle for two years.

Outlook: Recycled board producers have been trying to raise prices in 1987, not only due to rising costs for wastepaper and energy, but also because of improving market conditions.

West Coast producers set the pace early in the year, announcing a hike of about 4% to 6% or $20 to $25 in that region. Prices were raised as slated through Apr. 1, marking the first increase on the West Coast in two years. This was followed by major producers in the East announcing a $20 to $40 increase, taking effect through June 1.

With production for the year expected to be up about 4.5% from 1986 to 8.5 million tons, producers were optimistic that prices would go up in 1987.

Capacity additions slated for the year were also favorable to continued market stability. According to API estimates, 394,000 tons are scheduled to come online through 1989.

This should keep markets for such uses as boxboard for folding cartons firm this year. Limited capacity in competing materials, such as solid bleached sulfate and unbleached kraft board, will also reduce any market loss from these grades. Setup boxboard demand should also remain good this year due to continued interest in specialty products, according to Dept. of Commerce forecasts.

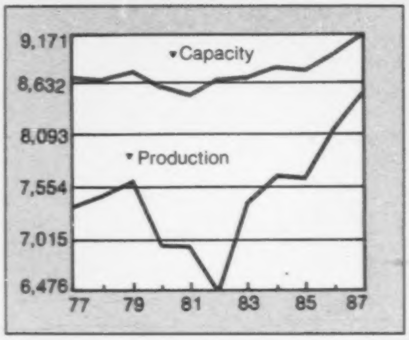
Gypsum liner consumption has been strong in recent years, due to robust construction activity, and is expected to remain relatively firm in 1987. Rising interest rates in the second quarter, however, could possibly weaken demand later in the year.

Prices: Competitive markets have depressed recycled boxboard prices since the early 1980s and have caused more variation in regional and individual transaction prices. Prices have been higher in the West and more competitive in the Midwest and eastern U.S. However, prices began to firm late in the year, causing boxboard producers to slate price increases during the first half of 1987. Recycled containerboard prices have generally followed the recovery in kraft linerboard and semichemical medium that began last year. The market for medium, however, remains softer than that for linerboard.

Clay-coated 20-pt folding carton boxboard (rolls), $/short ton, year-end: 1975, $257; 1976, $262; 1977, $284; 1978, $305; 1979, $355; 1980, $380; 1981, $400/425; 1982, $380/425; 1983, $370/425; 1984, $375/425; 1985, $350/400, 1986, $380/420. Bending 20-pt chipboard (rolls), $/short ton, year-end: 1975, $204; 1976, $212; 1977, $219; 1978, $225; 1979, $260; 1980, $260/275; 1981, $270/280; 1982, $280; 1983, $280/300; 1984, $300; 1985, $300; 1986, $320.

Markets: Market demand for recycled paperboard grades, measured by their 1987 capacity share, is: folding boxboard, 29.1%; setup boxboard, 3.1%; corrugating medium, 17.2%; gypsum linerboard, 14.4%; linerboard, 6.1%; container chipboard and filler board, 0.5%; other paperboard, 29.6%. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1985	1986	1987e
Production¹	7,630	8,143	8,500
Capacity	8,795	8,948	9,171
Utilization rate	86.8%	91.0%	92.7%
Imports	68	104	200
Exports	246	320	250
Apparent U.S. consumption	7,452	7,927	8,450
lb/capita	62.20	65.60	69.60
GNP ratio	2.08	2.16	2.24

e = Estimate.
1. American Paper Institute data.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity (000 tons)	Market share (%)
1. CCA	625	6.8
2. Newark Group	610	6.7
3. Sonoco Products	600	6.5
4. Jefferson Smurfit	546	6.0
5. Caraustar Industries	480	5.2
6. Inland Container	455	5.0
7. U.S. Gypsum	377	4.1
8. National Gypsum	365	4.0
9. Waldorf	365	4.0
10. Rock-Tenn	307	3.3

Market share of top five companies:
31.2

Market share of top ten companies:
51.6

Total U.S. capacity (1987):
9.171 million short tons

field, Ore. They have been working without contracts since the old ones expired Mar. 15 and May 1.

Also in the Northwest, contracts have expired at three other Washington paper mills: Longview Fibre Co.'s mill in Longview, Boise Cascade Corp.'s Steilacoom mill, and Scott Paper Co.'s mill in Everett. Negotiation talks are currently under way with all three companies.

- AWPPW members at **Boise Cascade Corp.**'s mills in Vancouver, and Wallula, Wash., and St. Helens, Ore., and at the converting operation at Salem, Ore., have opened their master bargaining on economic issues, according to a company spokesman. Negotiations up to this point had been concerned with local issues. The old contracts at all four locations expired on Mar. 14.
- Members of the United Paperworkers International Union who are currently negotiating a new contract at **Stone Container Corp.**'s 1,850-tpd linerboard mill at Missoula, Mont., have taken a strike vote, although a ten-day strike notice, required under the terms of the previous contract which expired May 31, has not yet been given. Negotiations are still continuing, according to a company spokesman.
- An industry source has reported the details of a new labor agreement that has been reached between UPIU workers and Stone Container Corp. at the company's 1,750-tpd linerboard mill in Florence, S.C. The pact, which was ratified on May 8, will be effective retroactive to Nov. 1, 1986. It gives lump sum payments of $1,500 to $2,200 in the first year and $1,200 to $1,500 in the second year for day and shift workers, respectively. In the third year, workers will receive a 3% wage increase. In addition, Dec. 24 and 25 were unrestricted; workers who come in on either day will receive double time. The Sunday premium was reduced and will be eliminated entirely on Aug. 1, 1989. Flexibility language was also included. The contract will expire Aug. 31, 1989.
- **Jefferson Smurfit Corp.** has concluded contract negotiations with the UPIU at its 305-tpd recycled board mill in Lockland, Ohio. The new three-year agreement, which is effective retroactive to Nov. 1, 1986, gives union workers wage increases of 2%/2.5%/3% before expiring on Nov. 1, 1989. ■

SALES/EARNINGS

Canadian earnings rose 772% in the first quarter

First-quarter earnings for Canada's paper and forest products industry climbed 772% on increased sales of 13% compared with the first quarter of 1986. Most of the good news can be attributed to improved prices for market pulp and newsprint—the Canadian industry's two biggest exports.

The continued strengthening of the Canadian dollar relative to the U.S. dollar, however, is already cutting into profits. Plus, the unsettled contract with the Canadian Paperworkers Union and the cost of the 15% export fee on softwood lumber going to the U.S. are clouding the picture. But despite these factors, most companies are predicting that 1987 results will be healthy and may even best the 77% improvement in earnings recorded between 1985 and 1986.

MacMillan Bloedel Ltd. has reported first-quarter earnings of C$60.4 million—the highest quarterly result before extraordinary items in the company's history. President and CEO Ray Smith said MB's containerboard and packaging group showed dramatic improvement. He added "We can't lose sight of the scratching and clawing we did to dig ourselves out of the recession that nearly buried us in 1981. We've a lot of catching up to do, so we're committing millions to our shape-up program for manufacturing facilities and preparing for the cycle dips that inevitably hit the forest industry." This year, MB will spend about $70 million at its Powell River Div., Powell River, B.C., and $30 million at the Harmac Div. pulp mill in Nanaimo, B.C. The export tax cost MB about $6 million in the quarter.

Abitibi-Price Inc.'s earnings figure inched up 0.9%. Bernd K. Koken, president and CEO, said improved performance in most of the company's business segments was largely offset by the negative impact of a stronger Canadian dollar. The company estimates that a 1¢ rise in the Canadian dollar trims about $15 million from the company's pretax profit. Abitibi and other Canadian newsprint producers are counting on the July 1 newsprint price hike to help them make up ground lost to the appreciating currency. About 13,000 metric tons of newsprint and groundwood papers were lost due to downtime taken for capital projects during the quarter, the company said.

Canadian paper/forest products industry first-quarter results.

	First quarter 1987 (C$000)			
Companies	**Sales**	**Change 1987/86**	**Earnings[1]**	**Change 1987/86**
Abitibi-Price	C$695,700	7.5%	C$21,900	0.92%
B.C. Forest Products	335,900	24.6	32,700	581.3
Canfor	294,800	8.5	20,700	840.9
Cascades	129,011	56.4	6,391	32.0
Consolidated-Bathurst	533,100	17.5	33,000[2]	124.5
Crestbrook Forest	54,893	35.6	6,778	1,357.6
Crown Forest Industries	223,200	1.9	16,400	168.9
Domtar	604,000	7.3	44,000[2]	22.2
Donohue	110,900	−5.5	8,000	81.8
Great Lakes FP	183,111	29.2	19,658	4,282.6
MacMillan Bloedel	719,400	17.3	60,400[2]	−18.6
Paperboard Industries (2/28)	21,657	17.7	980	94.4
Rolland	95,200	17.1	1,507	−29.7
Scott Paper	75,352	4.4	3,652	4.4
Weldwood	180,100	5.4	12,900	186.7
West Fraser Timber	92,700	22.3	12,000	380.0
Total	**C$4,349,024**	**13.3%**	**C$300,966**	**772.5 %**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Consolidated-Bathurst:** 1986 quarter excludes C$47.4-million write-down of investment in two oil and gas firms. **Domtar:** 1986 quarter includes C$6-million pretax gain. **MacMillan Bloedel:** 1986 quarter includes a C$45-million gain from sale of an investment.

Domtar Inc.'s earnings have increased 22.2% over year-earlier levels. The company's fine paper business has recorded higher profits because of increased selling prices, while the operating profit of the newsprint and groundwood specialties business was lower due primarily to a less favorable U.S. exchange rate, according to Domtar.

Consolidated-Bathurst Inc.'s earnings were more than double those of the year-earlier quarter, and the company expects 1987 results to exceed 1981's level, when Con-Bath earned $101 million. President and CEO Oscar Stangeland said that increased shipments and price hikes in newsprint, market pulp, and containerboard were offset slightly by a stronger Canadian dollar. He estimated that the resurgence of Canada's currency relative to the U.S. dollar cost Con-Bath $4 million in the first quarter. However, the company is predicting that both 1987 and 1988 will be extremely profitable.

British Columbia Forest Products Ltd. had a 531% increase in earnings over year-earlier levels. The only weak area was lightweight coated paper. The market for LWC was under pressure from offshore imports and additional capacity. Strong newsprint and pulp sales have managed to offset this weakness.

Canfor Corp. improved its earnings by 840%—the best quarterly result since the company went public. Canfor expects buoyant markets for pulp and sack kraft paper to continue through this year. In contrast, the lumber market will probably weaken. The company paid $6.5 million in taxes on its softwood lumber exports to the U.S. during the quarter. ■

EXPANSION/MODERNIZATION

Scott will spend $120 million on Muskegon mill

Scott Paper Co. will spend $60 million to rebuild one of two coated freesheet paper machines at its S.D. Warren Div. mill in Muskegon, Mich. This follows a similar recent announcement of a $60-million project to improve the mill's energy generation system.

A company spokesman would not say how much the capacity increase would be, but the mill currently is believed to be rated at 400 to 425 tpd of No. 1 coated paper. When completed in the fall of 1988, stated spokesman Michael Kilpatrick, the rebuilt machine will produce higher quality paper.

Kilpatrick said the mill already is the largest producer of premium coated paper for such end uses as annual reports and high-quality brochures and catalogs.

The 30-month energy system rebuild, originally announced in January, involves replacement of two old boilers with one new cogeneration unit that can burn biomass and pulverized coal. The upgrade is designed to make the mill self-sufficient in electricity generation. ■

St. Marys orders a new 130,000-tpy sc machine

St. Marys Paper Inc. has chosen Tampella Oy of Finland to supply its previously announced purchase of a supercalendered paper machine at its Sault Ste. Marie, Ont., mill. The machine will produce 130,000 short tpy. Tampella's major competitor was former partner Valmet Oy. This is the firm's first paper machine sale in North America. Previously, Tampella sold only paperboard machines here.

Tampella's new machine is part of a C$141-million project to increase the mill's top capacity to 250,000 tpy. That figure includes refinancing of current debt. The company currently is seeking final financing approval.

No. 1 machine, which may be brought back online when market conditions improve, will be mothballed. No. 1 is the smallest of the mill's four paper machines. After No. 1 is phased out of production, top capacity at the mill will be 217,000 tons.

Bill Hohns, vice president of Tampella Paper Machinery Co., the North American sales arm of Tampella, said the machine will have a hydraulic headbox, twin-wire former, and four presses. The machine has a 184-in.-trim, runs at 4,000 fpm, and will be able to make lower basis-weight papers down to 28 lb. The mill can currently make 31 lb to 40 lb paper.

St. Marys is planning to produce low-filled SC-B paper on the machine, although it has the capability to make premium SC-A paper. The general contractor is Commonwealth Construction of Burnaby, B.C. ■

Cascades announces two-year Jonquière upgrade

At Cascades Inc.'s annual meeting, company president Bernard Lemaire announced that his company will spend C$30 million in the next two years to upgrade its mill located in Jonquière, Que.

The bulk of the money will be used to modify the wet end of the mill's single cylinder machine, which was installed in 1961 and rebuilt in 1974, by adding a three-wire fourdrinier. Improvements will also be made to the dry end, raising No. 1's paperboard capacity from 160 metric tpd to 250 tpd. The upgrade will enable Jonquière to produce the lighter-weight, three-ply boxboard used in liquid packaging products, Lemaire said.

Jonquière currently sells about 170 tpd of bleached kraft market pulp. After the rebuild it will market about 120 tpd. In 1986, Cascades invested $2.5 million in the mill to modify the bleaching process and to add a second processing station.

Lemaire also said Cascades has agreed to purchase a 30% share in Cascades (Cabano) Inc. from Rexfor, Quebec's forest industries corporation. The $7.5-million cash purchase will raise Cascades' stake in the Cabano, Que., mill to 95%. Cascades invested $2 million in the mill last year to modify the paper machine and build a maintenance garage. Cabano's semichemical medium capacity increased from 82,000 tpy to 100,000 tpy as a result. ■

ACQUISITIONS/MERGERS

L-P, Daishowa terminate talks over sale of Antioch

Louisiana-Pacific Corp. recently announced that negotiations concerning the sale of its Fibreboard Corp. container division to Daishowa America Co. Ltd. have been terminated.

The $160-million transaction between the two companies would have included the 250,000-tpy Antioch, Calif., containerboard mill and three

Bleaching chemical supply tightening, prices firmimg

CHLORO-ALKALI. The rollercoaster ride of chloro-alkali products is now in a climbing stage. Price increases are holding and supply and demand seem to be balanced for chlorine. The industry attributes a great deal of the record high operating rates (Feb.—92%, Mar.—96%) directly to the healthy demands of pulp producers, particularly for any gains made in caustic soda.

In 1986, shutdowns totaling 2,400 tpd helped balance supply and trim inventories. Plant openings in 1987 include the reopening of OxyChem's Taft, La., diaphragm cell unit and a new plant at Niagara Falls, N.Y. (a joint venture of DuPont and Olin called Niachlor). Installing technologically superior equipment (i.e., in production costs, product uniformity, and purity) has contributed to the profitability of chloro-alkali producers. The Asahi membrane cell process will come online at Niachlor, Brunswick (52,000 tpy in 1988) and three more plants in the Far East. ICI is applying its mono-polar cell to KOH production in England, the first commercial installation of this technology.

OxyChem has completed acquisition of the chloro-alkali assets of Diamond Shamrock. Canadian Oxy recently purchased the chloro-alkali unit at Squamish, B.C., from FMC.

Pulp mills ran at or near full capacity through most of 1986 and 1987 production looks similar. Paper-grade chemical pulp is only scheduled to grow 1% through 1990, split evenly between white and brown pulps. No new greenfield pulp mills are planned, although some studies have been done for linerboard expansion. Chlorine consumption may be threatened in the future, as concern for bleach plant effluent production mounts. One mill has retrofitted an oxygen delignification unit, and three new lines have incorporated it into their expansion projects.

Pulp & Paper is conducting a study to determine what alternatives mills will choose should intense chlorination be prohibited by strict environmental regulations (which are in place in one state already). The results will be presented at TAPPI-West.

List prices for chloro-alkali products soared 40% in 1986, and new price increases for this year have taken hold. The increase for chlorine is said to be firming all regional quotes (except for the Midwest), but price erosion of caustic due to oversupply may curtail any large profit jumps.

CHLORATE. Demand for sodium chlorate is expected to be stronger in 1987, particularly in the market pulp sector. Despite the adoption of oxidative extraction, chlorine dioxide consumption remains the same. Renewed interest in a high substitution of chlorine dioxide in the chlorination stage has been shown by producers applying short sequences with and without oxygen delignification. There are environmental benefits as well.

The supply of chlorate is ample, even with the phasing out of uneconomical graphite units over the past four years. One or two more units are predicted to shut down, which should assist the remaining U.S. producers to maintain their share against the Canadian shippers who have a production cost advantage (cheaper power). Mills are installing makedown units for delivered crystal products, although mills close to the chlorate source would have no interest in doing so.

The price of chlorate is on the way up. After several depressed years, announced increases have inflated the list, although discounting is common. Kemanord recently announced a price increase for July, and it anticipates the list rising again in early 1988.

OXIDIZERS. Peroxide and oxygen have gained wide acceptance during the 1980s. The applications of both in incremental additive roles appear to be leveling. For peroxide, its addition in the extraction stages and enroute to storage falls between 1 and 4 lb/ton. Our survey showed that mills use peroxide for export market pulp and where it can save steam and chemicals. A growth area for peroxide is in established oxidative extraction processes and in sulfite mills where it can assist in first stage delignification (without chlorine).

Interest in oxygen is very high. Its growth has been exponential over the past six years. Consumption may be flattening somewhat with the market for oxidative extraction approaching saturation. The growth curve accelerates each time a new oxygen delignification unit comes online, because those systems use three times as much oxygen as EO systems.

Price is not a big concern for consumers of oxygen. The supply is ample (Airco and Air Products recently installed new gas separation plants), and price increases are not likely in 1987. The list price of peroxide may soon become "unrealistic," with one new plant online (DuPont at Maitland) and another approaching startup (Degussa at Mobile, Ala.).

—*Michael Ducey*

TABLE 1: **U.S. and Canadian consumption of chemical pulp bleaching chemicals.**

U.S.	Cl_2	NaOH[1]	$NaClO_3$	H_2O_2	O_2[2]
1986 (000 tons)	1,680	2,534	215	9	80
% change from 1985	5%	7%	1%	1%	20%
% change in 1987	5%	8%	6%	5%	18%
end 1986 price[3]	175	90	300	645	70
% change 1985	40%	10%	10%	0	0
% change in 1987	15%	5%	7%	−10%	0
Canada[4]					
1986 (000 kilotonne)	520	930	195	2	42
% change 1985	2.7%	2%	5%	10%	20%
% change 1987	4%	4%	7%	5%	10%

1. Includes uses in pulping.
2. Includes uses in black liquor oxidation, kiln firing, environmental treatment.
3. *Chemical Marketing Reporter* figures ($/ton, standard form, freight equalized).
4. *Corpus Chemical Report.*

Sources for information include Dow USA, Kemanord, DuPont and Interox.

U.S. PAPER INDUSTRY SUPPLIED MORE THAN 50% OF ENERGY NEEDS IN 1986

South Atlantic region leads in self-sufficiency, while mills in the Middle Atlantic and North Central regions are lagging behind

By REGINA McGRATH, Assistant News Editor

The pulp and paper industry ranks third in energy purchases by U.S. manufacturing industries, after chemicals and primary metals. It consumes the most fuel oil, is the third-largest purchaser of electricity, is third in coal use, and is sixth in natural gas consumption. Spent pulping liquor is the main source of fuel, thanks in large part to the burgeoning number of kraft pulp mills. The second-largest source is bark and woodwaste. Energy costs have moved up to third place, behind fiber and labor, in terms of total cost to the pulp and paper industry. Since 1972, the U.S. pulp and paper industry has cut its use of fossil fuels and purchased energy by about 43%, while pulp, paper, and board production has risen by about 39%.

A survey conducted by the American Paper Institute shows that fossil fuel and purchased energy use by the pulp and paper industry per ton of output dropped from 19.2 million Btu in 1972 to 11.7 million Btu in 1986. Self-generated and residue energy sources, such as wood, bark, and spent pulping liquors, accounted for 56.7% of the industry's total energy consumption in 1986, the API reports. This compares with 40.9% in 1972 and 56.0% in 1985. Consumption of fossil fuels and purchased energy dropped by about 16%, while oil use declined 55% between 1972 and 1986. Natural gas consumption is about 29% below the 1972 level.

Mills in New England, the South Atlantic region, the Southcentral region, and the Pacific and Mountain regions all generated over half of their energy in 1986—the South Atlantic led with 65.0%. Mills in the Middle Atlantic region and the Northcentral region generated about one-quarter of their energy needs, according to the API. Last year, the industry sold 29.9 trillion Btu of energy and purchased 970.0 trillion Btu.

TABLE 1: **U.S. energy use per ton of pulp, paper, and paperboard production.**

	1986	1985	1972
Energy consumption (trillion Btu)	2,076.4	1,979.0	1,783.6
Total production (million tons)	75.6	71.2	54.5
Energy use/ton (million Btu)	27.5	27.8	32.7

Source: American Paper Institute.

PURCHASED ENERGY. The paper industry purchases about $2 billion worth of electricity annually. Electricity now accounts for about 45% of industry energy purchases, although for only 6.4% of the energy consumed.

Because of the energy crunch of the 1970s, the industry has managed to wean itself of dependence on fuel oil: since 1972, fuel oil use has declined 55%, although production of pulp, paper, and board has gone up 39%. By 1985, annual consumption of spent pulping liquors was equal to about 140 million bbl of fuel oil. According to Ronald Slinn, vice president of the API, making a ton of paper requires about 4.5 bbl of oil. This is more than the amount needed to make a ton of steel. Oil consumption reflects changes in oil prices, so OPEC holds the cards that may reveal future consumption patterns. In 1986, fuel oil accounted for about 8% of the energy consumed by the industry, compared with 7% in 1985.

Since 1981, natural gas use has declined, but it still accounts for twice as many Btus as fuel oil.

Consumption of coal has expanded by about 6%/year since the mid-1970s, and this trend is expected to continue. Coal supplies about 15% of the industry's energy needs and is its third-largest energy source.

COGENERATION. The pulp and paper industry leads U.S. industry in cogenerated and self-generated electricity capacity. The industry boasts 7,500 MW of cogeneration capacity, which satisfies about half of its electricity demand. By 1990, about 9,000 MW are expected to be onstream—an increase of about 20%. This follows a 26% increase between 1982 and 1985. Proposed power generation in cogeneration applications filed by the industry in 1984 and 85 was equivalent to about seven 1,000-MW plants, the API reports.

The only cloud on the horizon is a possible change in PURPA—the Public Utility Regulatory Policies Act of

1978. This act requires utilities to purchase and distribute cogenerated power produced by nonutilities at no greater cost to consumers than if the utility had generated the power itself. The API says it has identified some 270 pulp and paper mills, employing at least 155,000 people, in which cogeneration and PURPA play "a significant role in the continued well-being of the facility."

In 1986, about 22,000 MW of cogenerated capacity was operating in U.S. industry; of this, the largest portion—about 35%—belonged to the paper industry. The API estimates another 2,100 MW of potential economical capacity from the paper industry could come onstream by 1990 if PURPA benefits remain in place. (Most of the paper industry's cogeneration facilities are in the South. The new tax law, which reduces tax benefits for capital investment, may crimp some of these plans.)

In June 1986, Congress held hearings on PURPA, but these did not result in a new law. Utilities want to limit cogeneration by narrowing the criteria that delineate a qualifying facility. There is also disagreement on the method by which avoided cost is calculated, i.e., the cost incurred by the utility to generate, or buy from another source, the same unit of power that is bought from the cogenerator. Many states are enacting their own laws that complicate the scene further, and some utilities are becoming more vocal in their opposition to PURPA.

In the first half of 1987, the Federal Energy Regulatory Commission conducted meetings to solicit comments on all aspects of Section 201 of PURPA—the section that encourages developing cogeneration facilities. It is hoped that some consensus on the price of power from qualified cogeneration plants will be reached.

Because of changes in the tax law, electric utilities may be able to get away with charging cogenerators from 30% to 80% more to connect to the grid since these fees are now viewed as taxable income. On the other hand, quite a few utilities welcome new cogeneration plants since they eliminate the need for utilities to build costly new power plants of their own.

If push comes to shove, the paper industry may find an ally in environmental groups. Pulp and paper mills need to expend far less incremental energy to make a kWh of electricity in addition to steam than do large utilities. This reduces the amounts of incremental sulfur dioxide and nitrogen oxides that are emitted per kWh. Plus, the paper industry is installing new, more efficient boilers which incorporate fluidized bed boilers, coal gasification, and combined cycle systems that cut down on fuel use and emissions.

ENERGY PROJECTS. From the beginning of 1986 through the first quarter of 1987, the U.S. paper industry began the construction of ten new cogeneration plants. Probably the most interesting of these is the alternate energy power plant being constructed at Louisiana-Pacific Corp.'s 600-tpd bleached kraft market pulp mill in Samoa, Calif. (See related story on page 59.) ■

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ISSUE FOCUS: **PULPWOOD PROCESSING**

PULPWOOD COSTS REMAIN DEPRESSED EVEN AS THE DEMAND FOR PULP RISES

Even the weather is conspiring to help pulp producers earn healthy profits—raw material prices are not responding to increased demand

By REGINA McGRATH, Assistant News Editor

Pulp producers found themselves in the enviable position of being able to charge more for pulp while paying less for pulpwood during the first half of this year. Prices for woodchips and roundwood fell throughout 1986 and remained depressed in early 1987.

Although the U.S. paper industry is moving toward a record production year in 1987, the increased demand for raw materials has not driven up prices appreciably, largely because pulpwood supplies were thrown out of kilter by two anomalous events: the 1986 southern pine beetle infestation in the South, and the mild winter experienced in the Pacific Northwest.

Pulpwood consumption in the U.S. amounted to 91.4 million tons in 1986—a 6.6% increase over 1985's consumption level, according to the American Pulpwood Assn. Demand is expected to continue to rise in 1987.

THE BEETLE PLAGUE. Last year's southern pine beetle infestation, which ravaged much of the South, caused an oversupply of trees to be harvested as sawmillers attempted to harvest the timber before the bugs did. This created a mountain of chips that only began to erode this winter when rain made logging more difficult. Still, the average price for a cord of southern pine roundwood only rose 1.5% during the first quarter over fourth-quarter 1986, according to *Timber Mart-South*. The price actually fell 4.9% from first-quarter 1986.

Supplies of hardwood in the South are much tighter than softwood supplies, since the wet weather made logging of lowland hardwoods such as oak and gum particularly difficult, especially in southern Georgia and Alabama. Hardwood supplies in central Alabama were described by one source as "adequate but shaky" in the first quarter. A source said some sawmills took downtime in the first quarter because of lack of wood, but logging crews worked overtime to build up shrunken hardwood supplies. Hardwood roundwood prices increased 3.7% from first-quarter 1986, while the cost of hardwood chips was 4.6% higher this year, *TMS* reports.

The flip side of this coin is that the beetles are unlikely to make a comeback in 1987, thanks to the rains.

TOP-HEAVY NORTHWEST LUMBER MARKET. The slowdown in logging that normally occurs in the first quarter did not happen this year. The weather was mild, so loggers continued to harvest in the high country. Many sawmills in Washington and Oregon did not take holiday shutdowns or drop any shifts in order to process the timber. Woodchip inventories were therefore not drawn down during the winter but instead were augmented.

The situation was aggravated by the woodworkers' strike that occurred in British Columbia last year. More sawmills in the Northwest increased their operating rates to take up the slack caused by the strike. In general, Douglas fir chips were abundant in the Northwest during the first part of this year, while hemlock and alder chips were in shorter supply.

In retrospect, the strike turned out to be a blessing in disguise. Mills in the Puget Sound, Wash., area, which normally receive many of their chips from British Columbia, instead turned south and bought chips from Longview and Camas, Wash., and from Oregon City and Wauna, Ore. This helped postpone an oversupply of chips that was developing in Washington and Oregon.

For the first half of this year, the export price for Douglas fir chips to Japan remained unchanged from second-half 1986 levels at US$78.40/bdu f.o.b. One

TABLE 1: **Pulpwood prices have been weakening for a few years, and now pulp producers are reaping the benefits.**

	Year average (US$)			
Raw material	1984	1985	1986	1Q 1987
West Coast Douglas fir chips (f.o.b. export price to Japan)	[illegible]	[illegible]	[illegible]	78.40
Roundwood—pine[1] ($/cord)	[illegible]	[illegible]	[illegible]	[illegible]
Roundwood—hardwood[1] ($/cord)	[illegible]	[illegible]	[illegible]	[illegible]

1. Source: *Timber Mart-South*. Values are averages of prices in [illegible] southern states.

source indicated that second-half 1987 export prices might decline due to the abundance of these chips.

TROUBLE IN CANADA? The abundance of chips was also evident in British Columbia, particularly on the coast. Operators of small, independent sawmills accused major forest products companies of holding the price of woodchips at unrealistically low levels, despite the fact that these companies were earning healthy profits from soaring pulp prices. Sawmills report that they usually negotiate the price of woodchips with major buyers such as MacMillan Bloedel Ltd., Crown Forest Industries Ltd., and British Columbia Forest Products Ltd., but this year they claim the majors refused to negotiate.

According to a report in the *Globe & Mail*, sawmills were invoicing hemlock chips at C$80/bdu but pulp mills decided to pay only $70/bdu. Sawmillers believe another $12 to $15/bdu would even the stakes.

Sawmillers have little room in which to maneuver, however, because of large chip inventories due to the mild winter and strong lumber markets both in North America and abroad. Plus, pulp companies assert that other costs have risen since 1981 and their chip prices are fair. Chip supplies—mostly spruce—were in better equilibrium in interior British Columbia.

THE 15% DUTY AND CHIP PRICES. The effect on chip prices of the 15% duty tax placed on softwood lumber going from Canada to the U.S. has been buried under a mountain of chips, most sources agree. In the Pacific Northwest, U.S. sawmills were operating at maximum capacity as they tried to capture market share from Canadian mills saddled with the tax. Canadian sawmills were also operating at full capacity—any lumber they didn't ship to the U.S. could be shipped abroad given the strength of lumber demand in most overseas markets. All of this exerted downward pressure on the price of residual chips: spruce, pine, hemlock, fir, and cedar.

Regardless of the 15% duty, the U.S. market is becoming less attractive to Canadians because of the appreciation of the Canadian dollar relative to the U.S. dollar. This factor has also given U.S. lumber and chip producers an edge in competing for overseas markets.

The 15% fee will not have a major impact on the Canadian sawmill industry, concluded a study conducted by the International Woodworkers of America. The study predicts that fewer than 1,000 jobs are expected to be lost, and this will occur over several years. The study suggests that industry employment on the British Columbian coast may even rise because of increased exports to other markets. ■

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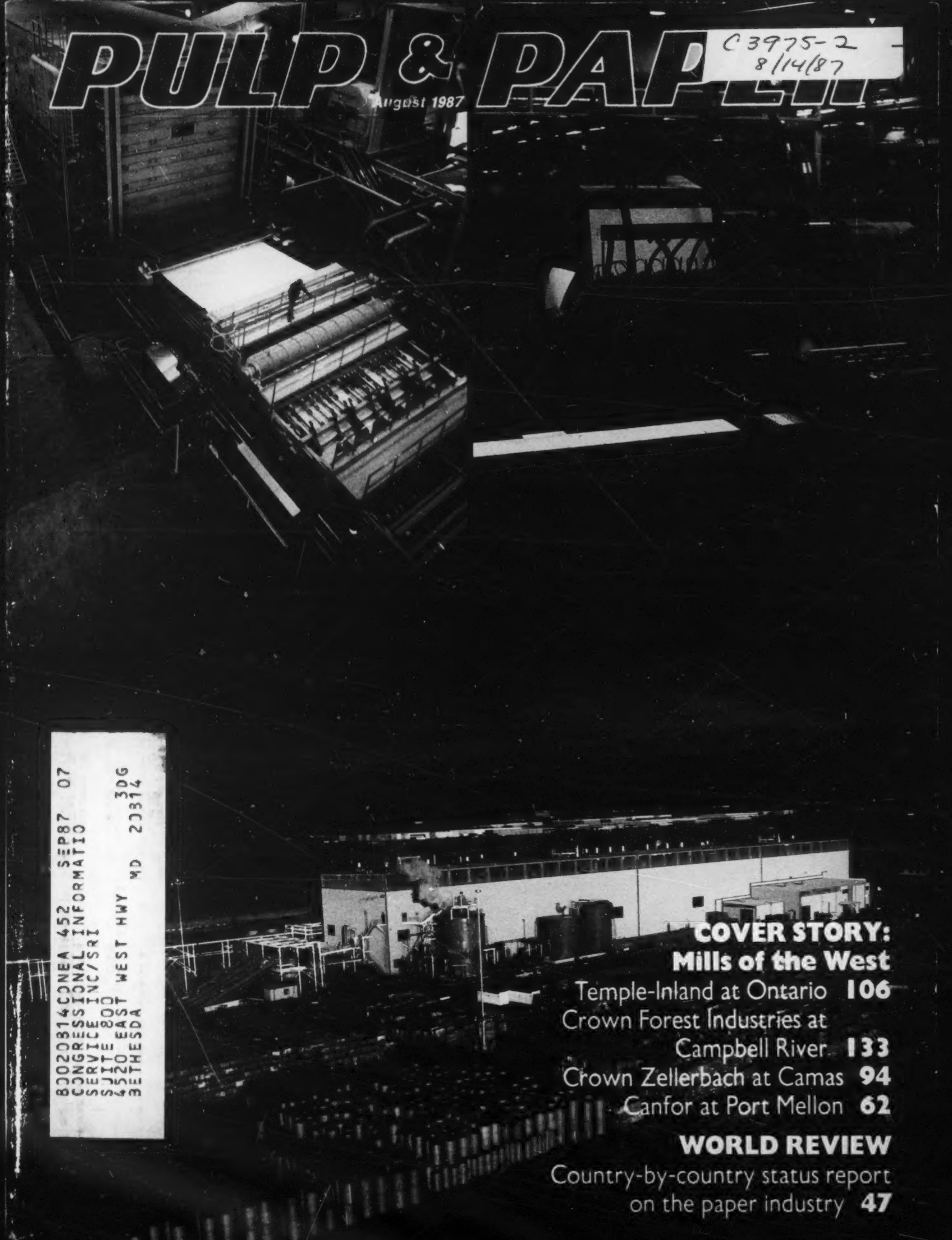
August 1987



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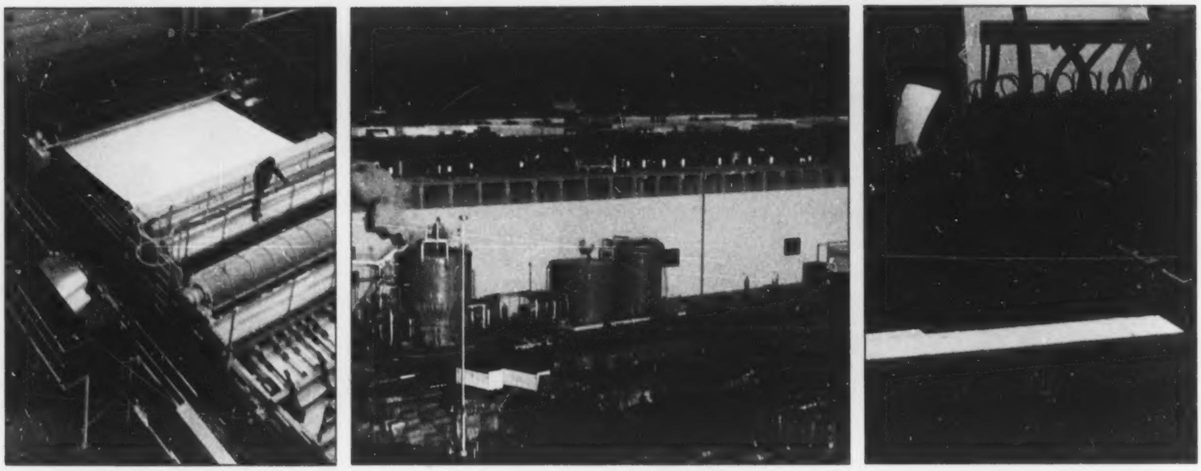

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Circulation Department, PULP & PAPER,
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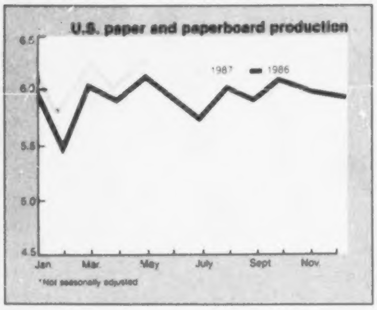
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.3 million tons in May, up 4.0% from the same month in 1986, according to the American Paper Institute. Production continued at a record-breaking pace for all sectors of the industry, API reported. Paper production for the first five months was up 2.9% compared with last year, while paperboard registered a 6.4% gain and market pulp was up 7.4%. U.S. imports of paper and paperboard were up 11.5% from a year-earlier, despite the weak U.S. dollar. Much of the gain was in uncoated groundwood, up 34%, and newsprint, up 7%, according to API.

Among major grades, recycled board led the pack with a 9.6% increase. Containerboard production was up 6.9% on the strength of continued record fiber box shipments. Strong demand from commercial printers helped fuel a 9.0% increase in coated paper and a 3.0% gain for uncoated free-sheet.

Canadian newsprint shipments totaled 815,000 tons in May, up 5.8% from the same month in 1986, while operating rates climbed to 97%. Shipments were up 6.8% for the first five months. Woodpulp shipments declined 2.0% compared with a year-earlier, as operating rates continued at 90% of capacity. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	May	500	1.6	5,685	1.7
Uncoated groundwood (s)	May	123	2.5	1,543	2.3
Coated paper (s)	May	554	11.5	6,585	9.0
Uncoated free sheet (s)	May	891	1.7	10,598	3.0
Other printing/writing	May	98	−15.5	1,387	1.8
Total packaging and other paper (s)	May	398	−8.5	5,137	−0.5
Tissue	May	441	−0.7	5,205	1.6
Total paper	**May**	**3,024**	**1.5**	**36,140**	**2.9**
Unbleached kraft paperboard	May	1,623	6.1	18,347	4.9
Semichemical medium	May	463	1.3	5,607	6.2
Bleached paperboard	May	373	0.0	4,448	3.5
Recycled paperboard	May	802	13.8	8,929	9.6
Total paperboard	**May**	**3,261**	**6.4**	**37,331**	**6.4**
Total U.S. paper and paperboard output	**May**	**6,285**	**4.0**	**73,741**	**4.7**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Apr.	4,882	2.5	58,800	4.0
Market pulp production	Apr.	670	14.1	7,857	7.4
Wastepaper consumption at paper/board mills	Apr.	1,437	6.8	17,201	3.6
Pulpwood consumption (cords)	Apr.	7,855	1.5	93,942	3.1
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	May	23.637	1.3	121.569[6]	3.6
Containerboard inventories at U.S. box plants and mills	May 1	2,375	−2.6		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Apr.	1,038	21.5	12,421	12.0
Imports of Canadian newsprint	Apr.	704	12.5	8,642[6]	7.1
U.S. paper exports (including products)	Apr.	427	4.7	5,038	9.4
Exports of unbleached kraft linerboard	Apr.	177	−5.3	2,224	12.6
Exports of woodpulp	Apr.	390	8.9	4,619	3.9
Norscan pulp inventories[4]	May 31	936	−13.1		
Norscan pulp operating rates[4]	May	93%	100%	99%	98%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	May	815	5.8	3,985[6]	6.8
Operating rates	May	97%	94%	98%	98%
Inventories held by U.S. consumers	May 31	1,336	−2.6		
Other paper/board shipments	May	531	5.1	2,644	6.2
Woodpulp shipments (export only)	May	600	−2.0	3,216	1.7
Operating rates	May	90%	90%	97%	89%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

BLEACHED PAPERBOARD: Market rebounds with good demand, few capacity additions

Grade structure: Solid bleached sulfate (SBS) paperboard is made primarily for folding carton and milk carton stocks from a furnish containing not less than 80% virgin bleached woodpulp. Other uses include file folders, linerboard, cups, round nested food containers, and plate/dish/tray stock. Calipers range from 10 to 28 pt, in low-, medium-, and high-density levels. Basis weights vary from 120 to 300 lb/3,000 ft². About half of the SBS produced is coated.

Production/capacity: Production in 1986 was up 8.7% to 4.29 million short tons, reaching the highest level on record, according to figures from the American Paper Institute. As a result, operating rates reached 94.6%, somewhat below the 1984 record of 96.7%. Exports also improved in 1986, rising 10.1% to 513,000 tons.

Capacity increases in recent years have been modest, keeping the market relatively firm even in downcycles. The market was even able to absorb the startup of a 175,000-tpy SBS paperboard machine at Westvaco Corp.'s Covington, Va., mill. No further major expansions are planned through the remainder of the 1980s. This is expected to keep capacity increases to just 104,000 tons, or about 0.8% annually, through 1989.

In some of the major end uses, 1986 production was up even sharper than the 8.7% overall increase. SBS folding carton stock, for instance, jumped 11.5%. Milk carton and food service board, however, was up in line with the rest of the market, by 5.6%. Most end-use markets remained fairly active early in 1987 as well.

Outlook. With capacity additions expected to remain negligible through the rest of the decade and no projected downturn in demand, SBS markets should be good through 1987. Production is forecast to rise 1.3% to 4.35 million tons this year, and operating rates should remain at about 94.6%.

Federal Paper Board Co. Inc.'s decision to modify its expansion plans at the Augusta, Ga., mill will help keep operating rates in line. No. 3 SBS machine's capacity will be raised only about 17,000 tpy, with completion scheduled for March 1988.

Demand for bleached board in 1987 should remain strong in the various end uses: folding carton stock should reach 2.05 million tons; milk carton stock, 650,000 tons; cup stock, 460,000 tons; and plate stock, 305,000 tons. Exports should rise 9.3% to 516,000 tons, provided currency exchange rates remain favorable.

Milk carton demand should remain relatively stable in 1987 as producers continue to develop new markets for liquid packaging, especially juices and juice derivatives. Competition from plastics should continue to ease as container sizes (notably, the gallon jug) in which plastics compete more effectively, have nearly reached the saturation point.

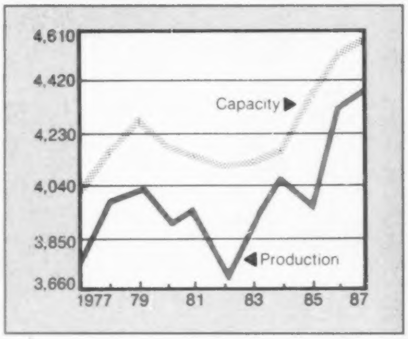
The most promising new market, however, will continue to be aseptic packaging. Food manufacturers will be looking at more ways to apply this relatively new technology to their products, increasing domestic demand. However, only one U.S. producer, International Paper Co., currently makes this highly specialized type of board.

Folding carton stock should also remain in good demand through 1987 as the proliferation of new products is expected to continue, as well as the repackaging of older, established products. Disposable dinnerware should also be in good demand this year from fast-food establishments. Consolidation in the cup business, with purchases in 1986 by James River Corp. and Fort Howard Corp., could cause some interesting competitive moves this year, however.

Prices: Levels began to recover in 1986 from the prior year's deterioration, with two hikes successfully implemented. Another increase slated for April 1987 was also in place in the second quarter, effectively increasing levels to about the same as their highs in 1984.

SBS 15-pt coated folding carton board (rolls), $/short ton, year-end: 1973, $300; 1974, $360; 1975, $360/365; 1976, $385; 1977, $405; 1978, $425/445; 1979, $490; 1980, $550; 1981, $625; 1982, $590/625; 1983, $590; 1984, $590/665; 1985, $550/590; 1986, $570/625; 1987 (June), $590/645.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1985	1986	1987e
Production[1]	3,948	4,293	4,347
Capacity	4,370	4,538	4,597
Utilization rate	90.3%	94.6%	94.6%
Imports	—	—	—
Exports[2]	466	513	561
Apparent U.S. consumption	3,482	3,780	3,786
lb/capita	29.08	31.28	31.15
GNP ratio	0.97	1.03	1.00

e = Estimate.

1. Because of grade switching, capacity utilization is difficult to define.

2. API production for export.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity (000 tons)	Market share (%)
1. Federal Paper	832	18.1
2. International Paper	810	17.6
3. Westvaco	657	14.3
4. Potlatch	537	11.7
5. Temple-Eastex	357	7.8
6. Champion Intl.	247	5.4
7. James River	235	5.1
8. Weyerhaeuser	200	4.3
9. Gulf States	190	4.1
10. Gilman Paper	185	4.0

Market share of top five companies:
69.5%

Market share of top ten companies:
92.5%

Total U.S. capacity (1987):
4.597 million short tons

NEWSPRINT

Ponderay, Finlay plan newsprint machines

Great Lakes Forest Products Ltd. and Finlay Forest Industries Ltd. have both committed to new newsprint mill projects. GLFP gave the expected go-ahead to build a 180,000-metric-tpy, US$300-million newsprint mill in eastern Washington state, while Finlay's board of directors formally approved a 216,000-tpy, C$198-million newsprint machine next to its refiner groundwood market pulp mill in Mackenzie, B.C. In addition, Newsprint South Inc. recently secured financing for its proposed 225,000-short-tpy greenfield newsprint mill, which would be constructed near Grenada, Miss.

The Washington state project is a joint venture among Lake Superior Forest Products Inc., a GLFP subsidiary, and five publishers. It was put on hold in 1985 when one of the five original publishing partners, Chronicle Publishing Co. (San Francisco, Calif.) pulled out. But Knight-Ridder Newspapers Inc. (Miami, Fla.) recently joined the four other publishers—Kearns-Tribune Corp. (Salt Lake City, Utah), McClatchy Newspapers (Sacramento, Calif.), Central Newspapers Inc. (Indianapolis, Ind.), and Copley Press Inc. (San Diego, Calif.) The new mill at Usk, Wash., about 50 miles north of Spokane, will be known as Ponderay Newsprint Co. (*P&P*, April 1987, p. 25).

LSFP will own 40% of the project and will act as managing partner, responsible for construction and operation. Other contractors will be chosen within several months and some site work may begin in late fall or in the spring, with startup probably in late 1989 or in 1990, a GLFP spokeswoman said.

First for interior B.C. The new Finlay newsprint machine will be the first ever constructed in the British Columbia interior. The 303-in.-trim, high-speed twin-wire will be supplied by Voith SA from Brazil. Work has already begun—with one report that 350 construction workers are already on the site—and startup is targeted for the spring of 1989. Croftech Inc., the British Columbia Forest Products Ltd.'s engineering division, will oversee the project, and H.A. Simons International is responsible for engineering. BCFP increased its interest in Finlay from 42.7% to 50% last April.

All of the existing mechanical pulp mill's output as well as a small amount of kraft pulp will be used by the new machine to make newsprint. Noting that groundwood pulp markets have been extremely volatile over the past few years, FFI president Conrad Pinette said the newsprint machine will bring "new stability and growth" to the company's integrated sawmill operations and pulping operations. Last year, the Finlay complex produced a record 137,000 tons of groundwood pulp and 248 million bd ft of lumber.

Total cost of the project is C$212 million, which includes $14 million for modernization of sawmills.

Newsprint South gets financing. A wholly owned subsidiary of Mississippi Chemical, Newsprint South Inc. recently secured public and private financing of approximately $290 million for its 225,000-tpy greenfield newsprint mill in Grenada, Miss.

Rust International Corp. is the engineering and construction contractor for the integrated thermomechanical pulp (TMP)/newsprint mill, which will have room for an additional machine, although only one is currently planned. A machine supplier will be chosen by about mid-August.

Newsprint South was awarded an $8.6-million Urban Development Action Grant and secured about $278 million in private funds from Wheelabrator Technologies Inc. and Signal Capital Corp. Construction is due to begin in October or November, with completion scheduled for late fall or early winter of 1989.

Alberta seeks newsprint mill. Provincial officials in Alberta, Canada, are seeking a forest products company and/or publisher to build a proposed integrated greenfield newsprint/publication papers mill in Alberta. A bleached chemi-thermomechanical pulp (CTMP) mill also is under consideration.

Public funds will likely be made available through loan guarantees and/or provincial and federal incentives. The newsprint mill probably would have a capacity betweeen 100,000 and 200,000 tpy and a cost of at least C$300 million. If built, the project would be the first paper mill in the province, which currently has two major pulp mills, wood products plants, and construction paper/board mills. Officials recently received a report on the potential project from Sandwell Swan Wooster Inc. of Van-

Major North American newsprint capacity expansions.

Announced	Mill	Capacity (000 metric tpy)	Startup
CIP	Gatineau, Que.	60 (net)*[1]	1987
Great Northern	E. Millinocket, Maine	93	1987
[illegible]	Ville de la Baie, Que.	72	1987
Donohue	Clermont, Que.	140 (net)*[2]	1987
Crown Forest[3]	Elk Falls, B.C.	50	1988
[illegible]	Alma, Que.	(60)[4]	1988
Finlay Forest	Mackenzie, B.C.	216*	1989
Newsprint South	Grenada, Miss.	205*	1989
Southeast Newsprint	Dublin, Ga.	100*	1990
GLFP (Ponderay)[5]	Usk, Wash.	164*	1990
GLFP	Thunder Bay, Ont.	60 (net)*[6]	1991
Proposed			
Bear Island	Ashland, Va.	200*	n.a.
[illegible]	Gold River, B.C.	225*	n.a.
Donohue	Amos, Que.	180*	n.a.

*New newsprint machines. 1. New 190,000-tpy machine replaces older unit. 2. New 180,000-tpy machine replaces 40,000-tpy unit. 3. Conversion to directory paper. 4. Recycled newsprint. 5. Partnership with five publishers. 6. New 240,000-tpy machine replaces two older units.

couver, B.C., but specific conclusions of the study were not immediately available.

Still, the province reportedly has narrowed down the possible sites to five regions. Four of the five are: Brazeau, Whitecourt, Athabasca, and High Prairie. These forestlands are composed of a combination of softwood and hardwood timber (especially aspen, previously considered a "weed" growth), usable for pulp in most paper grades, although the province seems to be pushing hardest for a newsprint mill.

Possible Oregon mill. An as yet unnamed northwest U.S. forest products firm is considering the construction of an integrated TMP/newsprint or publication papers mill at sites near Medford, Ore. Also, a separate project, a kraft pulp mill, is being considered for Coos Bay, Ore.

The $300-million newsprint project faces several regulatory hurdles from both local and state environmental laws and is in the very preliminary stages of study, according to Daniel Breck of Woodbridge Reed Associates, the project consultant. Local residents at first expressed concern about air pollution from the pulp mill, but their fears were allayed when officials visited the Quesnel River, B.C., pulp mill, which makes both CTMP and TMP. The remaining barriers relate to effluent discharges into the nearby Rogue River, which is designated wild and scenic. ■

More newsprint capacity coming on in Europe

Shotton Paper Co. Ltd. is planning to build a second newsprint machine at its mill in northern Wales. Slated to start up by 1990, the 200,000-metric-tpy unit will double the mill's capacity, making it the largest newsprint producer in the U.K. This unit will push western Europe's newsprint capacity over the 8-million-tpy mark, up from 1.2 million tons in 1986.

Most of the machine's output will be sold in the U.K., but exports are expected to remain at their current level of 15% to 20% of mill output. The company has not yet decided what type of pulp it will use to furnish the new machine. The existing machine is supplied by an 800-tpd TMP line.

■ This month **Parenco BV** will start up new No. 1 newsprint machine at its Renkum mill in the Netherlands. The Valmet unit will make about 190,000 tpy of newsprint for western Europe. It will be supplied by a new 160,000-tpy Sprout-Bauer TMP line and will also use some secondary fiber. The new unit will increase mill capacity by 150,000 tpy to 550,000 tpy of newsprint.

■ **Hylte Bruks AB** of Sweden has ordered a 774-tpd Bel Baie newsprint machine from Beloit Walmsley to be installed at its mill in southwestern Sweden. The unit will start up in April 1989. ■

Great Northern completes rebuild of No. 5 machine

Great Northern Papers, a division of Great Northern Nekoosa Corp., recently brought on line rebuilt No. 5 newsprint machine at its mill in East Millinocket, Maine. No. 6 newsprint machine was shut down for modernization July 6.

The $155-million modernization (P&P, May 1987, p. 27) will increase potential mill capacity 40% to 326,000 tons, but the increase will be offset by the permanent shutdown of two other machines when both rebuilds are online in mid-September.

Other improvements already completed include upgrades of the pulping system and groundwood cleaning and thickening system, a new sulfite storage tower, new savealls, upgrade of the kraft refining system, and new mechanical wrapping and conveyor lines in the mill's automated finishing system. Drying sections for both machines also are being upgraded. ■

LINERBOARD

Gaylord to install 1,000-tpd machine at Bogalusa

Gaylord Container Corp. has announced plans to invest more than $100 million to install a 1,000-tpd linerboard machine at its Bogalusa, La., mill. The machine is scheduled to start up by 1989 and will boost the mill's capacity from 1,500 tpd of linerboard and kraft paper currently to 2,500 tpd.

It will be the only new linerboard machine definitely scheduled for installation in the U.S. over the next several years.

CRS Sirrine Inc. has been contracted to design and engineer the machine, which will produce "the highest quality lightweight linerboard—42-lb and under—available in the industry," the company said.

A company spokesman indicated that the total cost of the project could be higher once engineering decisions

Major U.S. linerboard expansions.

[illegible]

are made regarding modifications to the pulping and recovery system needed to support the new machine. The mill's "back end" was significantly modernized by a $120-million program in the late 1970s, which may help to keep the total cost of the project down.

There are no definite plans to shut down any of the four remaining machines at the mill once the new machine is started up. Machines already existing at Bogalusa include No. 2 (124-in. trim), No. 5 (124-in.), No. 6 (144-in.), and No. 7 (198-in.) The three smaller machines all produce some bagpaper.

Formerly the containerboard division of Crown Zellerbach Corp., Gaylord was acquired last November by an investor group headed by president and chief operating officer Warren J. Hayford and chairman and CEO Marvin A. Pomerantz.

Hayford said the Bogalusa project reaffirms "our commitment to building Gaylord into a leading world-class packaging company." ■

Inland to modernize Orange mill, expand by 250 tpd

Inland Container Corp. recently announced the plans for a $60-million expansion of its Orange, Texas, linerboard mill. The Inland modernization project will add about 250 tpd of capacity at the mill and is scheduled to be completed in 1989.

The program will focus on improving production rates to bring productivity of the 19-year-old facility to a "competitive level," the company says. Temple-Inland Inc. is planning to upgrade the mill after its acquisition from Owens-Illinois Inc. in mid-1986.

The major projects announced will include an upgrade of the woodyard chip screening equipment, the replacement of the pulp mill digester control system and refiners, and overall modernization of the stock preparation area. In addition, the program includes modernization of the two paper machines and the two recovery boilers and the addition of new equipment to further reduce odorous emissions. Tampella announced that it would be supplying a new press section for No. 1 machine, including a Long Nip Press. ■

Australian firm acquires Georgia Kraft's Macon mill

A little-known Australian company has emerged as the successful bidder for Georgia Kraft Co.'s 1,500-tpd linerboard mill located in Macon, Ga. In addition, Pratt Holdings Pty Ltd. will acquire 200,000 acres of woodlands in Georgia and a large lumber and plywood manufacturing complex located at Madison, Ga., as part of the sale. The agreement, which is awaiting various government approvals, is expected to be completed in approximately two months.

When completed, the sale will result in a nonrecurring after-tax gain to Georgia Kraft of about $74 million, which will be passed through in equal shares to the joint venture's parents, Mead Corp. and Temple-Inland Inc.

Few details were available about the purchaser, who was mysteriously described in the press release announcing the sale as having "diversified interests in the forest products industry on four continents." Industry observers say the holding company has interests in packaging and financial services in Australia and owns a trading firm in the U.S. as well as an interest in a New Jersey box company.

The release also stated that "the new owner looks forward to working with the existing management to enhance the facilities and to increase productivity." The Macon mill has two linerboard machines and an original 200-in.-trim unit, as well as a 186-in.-trim Tampella machine that was installed in 1980. As part of that previous expansion, a 600-tpd secondary fiber plant and new bark power boiler were additionally installed at Macon.

The sale of the Macon mill is related to the planned dissolution of the Georgia Kraft joint venture that was announced earlier this year (*P&P*, May 1987, p. 27). Under the planned agreement, Mead would take over the Georgia Kraft venture's Phenix City, Ala., coated kraft board mill, while Temple-Inland would take over the linerboard mill that is located in Rome, Ga. ■

Weyco to buy six container plants from Mead Corp.

Mead Corp. will sell six of its corrugated container plants to Weyerhaeuser Co. as part of a program to refocus some of its assets as well as expand production of its coated kraft board. No sales price was disclosed.

The container plants are located in Albert Lea, Minn.; Amarillo, Texas; St. Joseph, Mo.; Memphis, Tenn.; Waterloo, Iowa; and Butner, N.C. (near Durham). The acquisition expands the number of container plants operated by Weyerhaeuser from 36 to 42 and increases their geographic coverage, according to a spokesman for the company.

Weyerhaeuser appears to be increasing its level of integration in containerboard—a strategy that other companies are pursuing in response to the last market downturn. Weyco purchased Tri-Wall Inc. (with three plants) in 1985 and bought a plant from St. Joe Paper Co. last year.

After the sale, Mead will continue to operate eight container plants, supporting them with containerboard from its 330,000-tpy semichemical medium mill in Stevenson, Ala. ■

LABOR

IP replaces striking workers at two of its mills

International Paper Co. has hired permanent employees to replace striking members of the United Paperworkers International Union at its mill in Jay, Maine, and at its Nicolet Paper Co. subsidiary in De Pere, Wis. Court injunctions at both Jay and at Lock Haven, Pa., have limited the number of pickets the UPIU can post at mill gates.

The UPIU has been striking IP at four mills: Jay, Lock Haven, De Pere, and Mobile, Ala.. The union has given notice that none of the striking locals will sign a new labor agreement at any one mill until there are acceptable contracts offered at all mills. In all, about 3,990 UIU members are striking IP.

Approximately 200 permanent replacements have been hired at the 1,300-tpd printing/writing paper mill in Jay, and applications are coming in at the rate of 100/day, according to mill spokesman Joseph Pietroski. The five paper machines at the mill are

ISSUE FOCUS: WORLD REVIEW

PAPER PRODUCTION AND CONSUMPTION RECORDS BROKEN IN ‘86; ‘87 LOOKS GOOD

Latin America and Asia spearheaded the rise in production; currency fluctuations continue to be a big factor in industry profitability

By PETER SUTTON, JOHN PEARSON, HUGH O'BRIAN, International Editors

World paper and board production soared by 5.1% in 1986 to set a new record of 203.1 million metric tons. It was the first time that output had crossed the 200-million-ton mark and it is a landmark in the history of the industry. Apparent consumption also broke all records, rising 5.1% to 202.4 million tons. That corresponds to a per capita consumption of about 93 lb.

After a lackluster 1985, the improvement in output was general, with big gains being made on most continents. Percentage-wise, Latin America's 7.9% growth to 9.9 million tons was the most spectacular, while Asia registered a 7.4% growth, passing 41 million tons for the first time. North American production, having fallen in 1985, bounced back by 5.8% to 79.7 million tons. Western Europe recorded 3.5% growth, with output passing the 50-million-ton mark.

World pulp output also hit a new record of 146.1 million tons, up nearly 4% from 1985. The biggest growth was in North America, where output rose 5.8% to 73.6 million tons. Nordic countries increased their ouput to 19.3 million tons, up by just over 1%.

Two main factors behind the success of 1986 were:

- Sustained economic growth led by a U.S. economy that maintained its momentum, a steady western European performance, and—apart from Japan, where growth slowed—booming Pacific Rim nations.
- Resolution at the start of the year of oversupply problems in commodity grades of pulp, paper, and board with producers taking downtime to achieve a better supply/demand balance. This led to stable pricing by the second quarter in many paper grades.

By the end of the year, the supply/demand balance was good enough in newsprint and in kraftliner for generally slow but steady worldwide price improvements to be implemented. Growth in demand for advertising kept most printing grades buoyant, although price performance was patchy. For market pulp, prices rose steadily in the second half of 1986 and into the first-half of 1987.

All figures in this review are in metric tons.

World's top 20 producing and consuming countries

PAPER AND BOARD PRODUCTION
(000 metric tons)

	1986	% change 1986/85
1. U.S.	64,416	+5.8
2. Japan	21,062	+2.9
3. Canada	15,234	+5.5
4. U.S.S.R.	9,975	+0.3
5. People's Rep. China	9,986	+9.6
6. Fed. Rep. Germany	9,405	+2.5
7. Finland	7,549	+1.4
8. Sweden	7,357	+5.1
9. France	5,585	+4.5
10. Italy	4,637	+1.1
11. Brazil	4,485	+11.5
12. U.K.	3,941	+4.7
13. Spain	3,153	+8.2
14. Rep. Korea	2,773	+19.9
15. Taiwan	2,527	+25.2
16. Mexico	2,470	+0.9
17. Austria	2,183	+2.6
18. Netherlands	2,042	+7.3
19. India	1,800	+13.2
20. Australia	1,642	+5.0

PULP PRODUCTION
(000 metric tons)

	1986	% change 1986/85
1. U.S.	51,938	+5.7
2. Canada	21,686	+6.2
3. Sweden	9,395	+3.0
4. Japan	9,240	−0.4
5. U.S.S.R.	8,350	+0.4
6. Finland	7,928	−0.6
7. People's Rep. China	6,583	+6.4
8. Brazil	3,970	+5.1
9. Fed. Rep. Germany	2,219	+0.7
10. France	2,022	+3.9
11. Norway	1,954	−1.2
12 South Africa	1,875	+8.7
13. Spain	1,504	+4.5
14. Portugal	1,405	+5.0
15. Austria	1,344	+1.7
16. New Zealand	1,110	−3.1
17. Czechoslovakia	1,086	−2.7
18. India	1,050	—
19. Poland	876	+1.0
20. Australia	870	+1.2

PER CAPITA CONSUMPTION
(lb/year)

	1986	% change 1986/85
1. U.S.	639	+2.1
2. Sweden	505	−3.4
3. Canada	465	+6.6
4. Finland	445	+6.9
5. Switzerland	421	+7.3
6. Fed. Rep. Germany	408	+6.3
7. Denmark	406	+7.6
8. Netherlands	392	+4.7
9. Japan	381	+3.6
10. Belgium	375	+5.6
11. New Zealand	348	−11.2
12. Hong Kong	337	—
13. Australia	320	−2.7
14. U.K.	315	+3.6
15. Norway	315	+4.4
16. Taiwan	289	+23.6
17. Austria	280	−4.5
18. France	278	+5.9
19. Iceland	245	+3.7
20. Italy	207	+3.3

REVIEW OF TOP 20 NATIONS IN PULP/PAPER PRODUCTION

Australia

Population: 16,000,000. Per capita consumption of paper and board: 145 kg/319 lb. Paper and board mills: 18. Pulp mills: 18 (sulfate: 2; sulfite: 1; semichemical: 4; mechanical: 8; soda: 2; non-wood: 1).

Paper/board capacity: 1,700,000 tons **Pulp capacity:** 1,225,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	1,091	1,177	861	775	76	92
Board	473	465	—	—	—	—
Total	**1,564**	**1,642**	**861**	**775**	**76**	**92**
Chemical woodpulp	—	—	—	—	—	—
Other pulps	860	870	186	223	10	20
Total	**860**	**870**	**186**	**223**	**10**	**20**

Austria

Population: 7,563,000. Per capita consumption of paper and board: 128 kg/282 lb. Paper and board mills: 34. Pulp mills: 15 (sulfate: 3; sulfite: 7; semichemical: 1; mechanical: 5; non-wood: 1).

Paper/board capacity: 2,533,000 tons **Pulp capacity:** 1,563,000 tons
Operating rate 1986: 86% **Operating rate 1986:** 86%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	1,786	1,832	302	318	1,204	1,303
Board	341	351	24	23	244	262
Total	**2,127**	**2,183**	**326**	**341**	**1,448**	**1,565**
Chemical woodpulp	999	1,035	278	291	277	330
Other pulps	322	309	37	25	—	—
Total	**1,321**	**1,344**	**315**	**316**	**277**	**330**

Brazil

Population: 138,493,000. Per capita consumption of paper and board: 29 kg/641 lb. Paper and board mills: 151. Pulp mills: 38 (sulfate: 16; sulfite: 3; soda: 6; semichemical: 4; non-wood: 9).

Paper/board capacity: 4,940,000 tons **Pulp capacity:** 4,416,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	3,536	3,998	119	278	484	668
Board	485	487	2	2	59	44
Total	**4,021**	**4,485**	**121**	**280**	**543**	**712**
Chemical woodpulp	3,371	3,510	37	38	926	896
Other pulps	405	460	2	2	11	18
Total	**3,776**	**3,970**	**39**	**40**	**937**	**914**

Canada

Population: 25,600,000. Per capita consumption of paper and board: 212 kg/467 lb. Paper and board mills: 76. Pulp mills: 34.

Paper/board capacity: 16,690,000 tons **Pulp capacity:** 24,833,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	13,742	14,508	373	421	9,858	10,412
Board	697	726	176	219	61	66
Total	**14,439**	**15,234**	**549**	**640**	**9,919**	**10,478**
Chemical woodpulp	11,456	12,219	167	170	6,501	7,085
Other pulps	8,963	9,467	53	50	669	750
Total	**20,419**	**21,686**	**220**	**220**	**7,170**	**7,835**

China, People's Rep. of

Population: 1,060,080,000. Per capita consumption of paper and board: 10 kg (e) /22 lb. Paper and board mills: 1,600e.

Paper/board capacity: n.a. tons **Pulp capacity:** n.a. tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	2,706	2,742	319	175	95	104
Packaging paper/board	4,001	4,594	378	878	113	163
Other paper/board	2,405	2,650	111	165	19	40
Total	**9,112**	**9,986**	**808**	**1,218**	**227**	**307**
Chemical woodpulp	872	942	454	483	—	—
Mechanical pulp	403	402	16	26	—	—
Reed, bamboo, other pulps	4,911	5,239	60	67	1	7
Total	**6,186**	**6,583**	**530**	**576**	**1**	**7**

Finland

Population: 4,919,000. Per capita consumption or paper and board: 203 kg/447 lb. Paper and board mills: 46. Pulp mills: 47 (sulfate: 18; sulfite: 3; semichemical: 3; mechanical: 23).

Paper/board capacity: 8,305,000 tons **Pulp capacity:** 8,825,000 tons
Operating rate 1986: 90% **Operating rate 1986:** 90%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	6,476	6,489	51	53	5,411	5,335
Board	971	1,060	20	20	756	828
Total	**7,447**	**7,549**	**71**	**73**	**6,167**	**6,163**
Chemical woodpulp	4,808	4,850	15	27	1,304	1,270
Other pulps	3,168	3,078	47	48	230	204
Total	**7,976**	**7,928**	**62**	**75**	**1,534**	**1,474**

France

Population: 55,300,000. Per capita consumption of paper and board: 126 kg/277 lb. Paper and board mills: 147. Pulp mills: 24 (sulfate 7; sulfite: 3; semichemical: 5; mechanical: 9).

Paper/board capacity: 5,500,000 tons **Pulp capacity:** 2,300,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	4,822	5,056	2,072	2,317	1,162	1,291
Board	520	529	450	482	147	146
Total	**5,342**	**5,585**	**2,522**	**2,799**	**1,309**	**1,437**
Chemical woodpulp	1,498	1,585	1,518	1,655	311	345
Other pulps	448	437	105	114	2	0
Total	**1,946**	**2,022**	**1,623**	**1,769**	**313**	**345**

Germany, Fed. Rep.

Population: 61,073,000. Per capita consumption of paper and board: 185 kg/407 lb. Paper and board mills: 177. Pulp mills: 34 (sulfite: 8; semichemical: 1; mechanical: 25).

Paper/board capacity: 10,602,000 tons **Pulp capacity:** 2,455,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	8,246	8,466	3,946	4,471	2,315	2,462
Board	932	939	386	430	571	559
Total	**9,178**	**9,405**	**4,332**	**4,901**	**2,886**	**3,021**
Chemical woodpulp	818	816	2,841	3,010	116	127
Other pulps	1,385	1,403	86	67	—	—
Total	**2,203**	**2,219**	**2,927**	**3,077**	**116**	**127**

EXPANSION AHEAD. There are already signs of an investment boom ahead. That in turn may prove a mixed blessing for the industry. In the period late 1988-90, companies may be faced with severe price problems as overcapacity, especially in newsprint and printing grades, builds up. Through the end of this year, however, the outlook remains bright.

AFRICA

IN AFRICA, THE PULP AND paper industry is dominated by one country, South Africa, which accounts for two-thirds of the continent's paper and board output and for about three-quarters of its pulp production. It has become more difficult than usual to estimate Africa's real performance because South Africa stopped issuing official statistics for its paper and board production and trade at the end of the first quarter of 1986. But *Pulp & Paper International* estimates total 1986 African paper and board production was 2.38 million tons, up 6.1% from 1985. Pulp production was 2.37 million tons, up by nearly 8% from 1985.

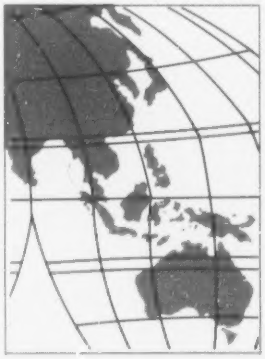
South Africa began to recover in 1986 from its worst recession in 40 years. Domestic demand for paper and board picked up in the second half of the year. At the same time, better international pricing for most bulk paper grades began to improve with two results for the country. First, the two major companies, Mondi and Sappi, began to enjoy better prices for their exports. And second, the flow of cheap imports into South Africa disappeared, allowing companies to improve their financial performances at home, too.

Between 1984 and 1985, Mondi and Sappi brought online major investments. By end-1986, both Sappi's Ngodwana mill expansion and Mondi's Richards Bay greenfield market pulp mill were running near capacity.

Nigeria has two out of its three major mill projects running, despite the downturn in the economy caused by the drop in oil prices. But both the kraft paper and board mill and the only newsprint mill in Nigeria are running below capacity, because of lower than expected domestic demand and difficulties in factors which affect many African countries—low per capita consumption, a weak economy, and difficulties in obtaining foreign exchange to buy raw materials.

In Zimbabwe, a good agricultural year led to good demand for paper and board, with output rising slightly to 75,000 tons. But the weakness of the South African rand against the Zimbabwe dollar and other local currencies led to a fall in the competitiveness of exports.

The countries of North Africa fared relatively well in 1986. Morocco's pulp makers enjoyed good demand for the 81,000 tons of bleached eucalyptus pulp produced during the year, and lower energy prices improved profitability. Egypt's Ratka mill completed an investment in a system to recover expensive chemicals from its straw pulping process. Meanwhile, Tunisia has also been investing. Early this year, a 15,000-tpy board machine started up at Enfidaville. Its output is expected to be sufficient to meet the country's entire future needs.



ASIA/ AUSTRALASIA

A BOOMING DEVELOPMENT pace in Asia's pulp and paper industry continued relentlessly through last year, with output of paper and board rising by 7.4% to pass the 41-million-ton mark for the first time. Pulp output was also at a record level of 18.9 million tons, up 3.3%.

Dominant in 1986 were the first signs of structural change in the world's second largest market for paper and board, Japan. It's paper and board output rose by 2.9% to just over 21 million tons, but that was well below the 5.8% increase in 1985. Behind the slowdown was the fast-rising international value of the yen, which limited the competitiveness of Japanese exports, in turn creating a fall off in demand for grades such as packaging grades. The high value of the yen also made Japanese exports of paper less attractive in Pacific Rim countries, and a fall of 30,000 tons or 3.5% was recorded in 1986.

Meanwhile, Japan for the first time is seeing a rise in imports. Barriers to trade, tariff and non-tariff, are being

Production by continents, world total (000 metric tons)

	PULP				
	1960	1970	1980	1985	1986
North America	32,964	54,912	65,969	69,563	73,624
Europe	20,965	34,853	40,235	41,966	42,480
Asia/Australasia	5,156	14,268	18,239	20,273	20,851
Latin America	821	2,224	5,848	6,579	6,808
Africa	124	900	1,502	2,194	2,369
World total	**60,031**	**107,157**	**131,793**	**140,575**	**146,132**

	PAPER AND PAPERBOARD				
	1960	1970	1980	1985	1986
North America	38,917	58,914	70,225	75,286	79,650
Europe	25,634	45,159	59,023	65,960	67,761
Asia/Australasia	7,861	20,621	31,962	40,580	43,397
Latin America	1,656	3,712	7,737	9,213	9,942
Africa	288	892	1,717	2,246	2,382
World total	**74,355**	**129,298**	**170,664**	**193,285**	**203,132**

TOP 20 PRODUCING NATIONS *(Continued)*

India

Population: 700,000,000. Per capita consumption of paper and board: 2kg/7lb. Paper and board mills: 288. Pulp mills: 1.

Paper/board capacity: 2,655,000 tons
Operating rate 1986: 68%

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	—	—	—	—	—	—
Board	650	700	—	—	—	—
Total	**1,590**	**1,800**	**—**	**—**	**—**	**—**

Italy

Population: 57,212,000. Per capita consumption of paper and board: 94 kg/207 lb. Paper and board mills: 357. Pulp mills: 20 (sulfite: 1; semichemical: 3; mechanical: 15 non-wood: 1).

Paper/board capacity: 5,175,000 tons **Pulp capacity:** 830,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	3,691	3,752	1,461	1,641	817	890
Board	896	885	155	157	188	186
Total	**4,587**	**4,637**	**1,616**	**1,798**	**1,005**	**1,076**
Chemical wood-pulp	50	147	163	1,645	1,719	59
Other pulps	519	506	125	110	4	3
Total	**666**	**669**	**1,770**	**1,829**	**63**	**53**

Japan

Population: 121,672,000. Per capita consumption of paper and board: 173 kg/381 lb. Paper and board mills: 489. Pulp mills: 64 (sulfate: 38; sulfite: 5; semichemical: 10; mechanical: 28; non-wood: 4).

Paper/board capacity: 24,617,000 tons **Pulp capacity:** 12,617,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	17,619	18,238	665	817	606	637
Board	2,850	2,824	36	38	263	202
Total	**20,469**	**21,062**	**701**	**855**	**869**	**839**
Chemical wood-pulp	36	9,013	9,051	1,990	2,266	15
Other pulps	266	189	278	297	5	2
Total	**9,279**	**9,240**	**2,268**	**2,563**	**20**	**38**

Korea, Rep. of

Population: 41,569,000. Per capita consumption of paper and board: 63 kg/139 lb. Paper and board mills: 150. Pulp mills: 5 (sulfate: 1; mechanical: 4).

Paper/board capacity: 2,858,000 tons **Pulp capacity:** 426,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	1,900	2,206	87	121	56	106
Board	412	567	2	1	54	174
Total	**2,312**	**2,773**	**89**	**122**	**110**	**280**
Chemical woodpulp	129	144	631	677	0	0
Other pulps	138	143	49	63	0	0
Total	**267**	**287**	**680**	**740**	**0**	**0**

Mexico

Population: 81,000,000. Per capita consumption of paper and board: 30 kg/66 lb. Paper and board mills: 64. Pulp mills: 15 (sulfate: 8; mechanical: 1; non-wood: 6).

Paper/board capacity: 3,316,000 tons **Pulp capacity:** 957,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	2,189	2,199	99	68	39	136
Board	259	271	7	3	—	—
Total	**2,448**	**2,470**	**106**	**71**	**39**	**136**
Chemical woodpulp	710	648	271	312	—	2
Other pulps	110	124	40	33	—	2
Total	**820**	**772**	**311**	**345**	**—**	**4**

Netherlands

Population: 14,563,000. Per capita consumption of paper and board: 178 kg/392 lb. Paper and board mills: 33. Pulp mills: 3 (mechanical: 2; non-wood: 1).

Paper/board capacity: 2,181,000 tons **Pulp capacity:** 158,000 tons
Operating rate 1986: 94% **Operating rate 1986:** 87%

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	1,297	1,383	1,427	1,513	804	887
Board	607	659	286	321	336	387
Total	**1,904**	**2,042**	**1,713**	**1,834**	**1,140**	**1,274**
Chemical woodpulp	—	—	525	568	18	24
Other pulps	138	133	30	25	3	2
Total	**138**	**133**	**555**	**593**	**21**	**26**

Spain

Population: 39,310,648. Per capita consumption of paper and board: 85 kg/187 lb. Paper and board mills: 165. Pulp mills: 26 (sulfate: 24; sulfite: 1; mechanical: 5; non-wood: 6).

Paper/board capacity: 3,390,000 tons **Pulp capacity:** 1,620,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	2,600	2,813	430	616	316	344
Board	313	340	29	40	113	93
Total	**2,913**	**3,153**	**459**	**656**	**429**	**437**
Chemical woodpulp	1,221	1,301	316	435	332	428
Other pulps	218	203	14	9	5	6
Total	**1,439**	**1,504**	**330**	**444**	**337**	**434**

Sweden

Population: 8,380,000. Per capita consumption of paper and board: 229 kg/504 lb. Paper and board mills: 55. Pulp mills: 55 (sulfate: 25; sulfite: 7; semichemical: 2; mechanical: 21).

Paper/board capacity: 7,885,000 tons **Pulp capacity:** 10,375,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	5,778	6,041	185	194	4,344	4,631
Board	1,223	1,316	69	77	921	1,005
Total	**7,001**	**7,357**	**254**	**271**	**5,265**	**5,636**
Chemical woodpulp	6,781	6,669	140	148	2,547	2,352
Other pulps	2,342	2,726	6	9	450	589
Total	**9,123**	**9,395**	**146**	**157**	**2,997**	**2,941**

dismantled, resulting in imports, which totaled 855,000 tons in 1986, now having a 4% share of consumption.

The fall in the yen's value made 1986 a boom year for two of the fastest growing paper industries along the Pacific Rim—Rep. Korea and Taiwan. Both were able to capitalize on the lower Japanese competitiveness in export markets. In Taiwan's case, output rose by 25.2% from 1985 to 2.53 million tons, and exports grew 59.9% to 149,000 tons. Domestic sales also rose 24.8%. Rep. Korea's performance was no less impressive. Paper and board output was up 25.2%, and exports rose 26.6%. Both countries are planning major capacity expansions for the period to end-1989.

For the third year running, People's Rep. China's paper and board output rose strongly. In 1986, it was just short of 10 million tons, up 9.6% from 1985. Output of packaging materials was up 15%. People's Rep. China is now the world's fifth largest producer of paper and board. However, per capita consumption remains a low 23 lb. Chinese pulp output also leapt by 400,000 tons in 1986 to 6.6 million tons. Indications are that the momentum in expansion of output will continue.

Indonesia's paper industry also made good progress in 1986. Output was 610,000 tons, up 20.6% from 1985. New capacity, especially in bulk grades such as newsprint, cut imports from 233,000 to 176,000 tons, while exports rose to 65,000 tons from 16,000 tons in 1985.

For the future, these key Asian economies look set to continue their fast growth, although Japan's growth will not be as fast as before.

Elsewhere in 1986, India showed a general improvement in output, although there are persistent labor and financial problems facing the paper companies. Meanwhile, in the Philippines optimism reigned as output rose, and 1987 promised one of the highest capacity utilization rates of recent years.

Output of paper and board in Australasia fell slightly in 1986, ending the year at 2.3 million tons. Pulp output fell from just over to just under 2 million tons. The main reason for the shortfall was a serious labor strike at one of the New Zealand mills.

The themes of 1986 for Australasia were restructuring and internationalization. It seems that both Australian and New Zealand companies are realizing that they are well situated to serve the fastest-growing paper and board markets in the world—the Pacific Rim countries.

In Australia, all the major companies have expansion plans and are eyeing the Pacific Rim as their market.

New Zealand's biggest company, Fletcher Challenge (FCL) has embarked on a major expansion of its forest products business. It is rumored to be looking for a Japanese partner to build a new newsprint paper machine at Tasman Pulp & Paper Co. Ltd.'s Kawerau mill on North Island in the early- or mid-1990s. FCL is also attempting to take over its main domestic rival, New Zealand Forest Products Ltd. NZFP is in turn trying to organize a merger with Australia's APM Ltd.

LATIN AMERICA

IN SPITE OF THE CONTINUING economic problems in most of the major countries in Latin America, it achieved the biggest percentage rise in paper and board output of any continent in 1986. The total production figure of 9.9 million tons was up 7.9% from 1985. Pulp production was also up by 3.5% to 6.8 million tons.

Brazil led the way with a 11.5% growth in paper and board production to 4.46 million tons. Per capita consumption rose to 64 lb from just over 57 lb in 1985. Stimulus for the 1986 growth came from government policy. In an attempt to arrest inflation, which was running at over 200%, prices and wages were frozen. A consumer boom resulted. GNP rose 8%. But by end-1986, the government was forced to suspend payments on its foreign debt, turning instead to the internal market for its borrowing. Internal interest rates rose to 40%/month. Inflation is now rising again, and it is forecasted to surpass 400% this year.

For Brazilian papermakers, the year saw domestic demand rise by about 8%. Government policy foresees a rise in education spending from 3% to 13% of the budget in the next few years, and this is expected to fuel domestic paper consumption for the future. In 1986, papermakers benefited from frozen pulp prices. For most of the year, the domestic price of bleached eucalyptus was only $220 to $240/metric tons (depending on the dollar-cruzado exchange rate). Pulp producers maintained their supplies to the internal market, mainly because they feared that the government would introduce controls on the amount that they were allowed to export if they did not fuel the internal boom. Profitability suffered. This year prices have been deregulated on the domestic market, and they have returned to international levels. The many pulp mill projects formulated last year are being held in abeyance, awaiting an improvement in the general economic situation.

A much brighter picture is to be seen in Chile. With an inflation rate of 17.4% and a rapidly falling external debt, it seems highly likely that at least one world-size pulp mill will start up by the early 1990s.

An important feature of 1986 was a spate of investment by New Zealand companies in Chile. It seems that the two nations will seek to cooperate in developing their resources, rather than competing against each other in the early part of the mid-1990s.

Argentina's paper industry also recovered in 1986 after a poor performance in 1985. The country still has weighty economic problems, but some stability is returning under the government's Austral stabilization

WORLD PULP, PAPER, AND BOARD INDUSTRY AT A GLANCE

	Population (1,000)	Number of mills		Capacity (1,000 tons)		Per capita (lb)	Consumption (1,000 tons)				Production (1,000 tons)			
		P & B	Pulp	P & B	Pulp		P & B		Pulp		P & B		Pulp	
							1985	1986	1985	1986	1985	1986	1985	1986
EUROPE														
Belgium[1]	10,000	14	2	974	385	375	1,611	1,703	599	597	841	850	321	304
Denmark	5,200	6	3	354	108	405	891	956	139	147	321	335	92	95
France	55,300	155	24	5,500	2,300	276	6,556	6,947	3,256	3,446	5,343	5,585	1,948	2,022
Germany, Fed. Rep.	61,073	177	36	10,602	2,455	407	10,624	11,285	5,014	5,169	9,178	9,406	2,203	2,219
Greece	9,700	22	3	430	65	132	528	583	163	217	325	373	20	26
Ireland	3,590	2	0	50	0	172	276	290	0	20	22	40	0	0
Italy	57,212	357	20	5,175	830	206	5,198	5,359	2,373	2,445	4,587	4,637	666	669
Netherlands	14,563	33	3	2,181	158	391	2,477	2,584	672	700	1,904	2,042	138	133
Portugal	10,230	94	8	805	1,352	124	522	578	435	438	650	665	1,338	1,406
Spain	39,311	165	26	3,390	1,620	189	2,943	3,372	1,432	1,514	2,913	3,153	1,439	1,504
United Kingdom	56,620	96	6	4,162	427	314	7,796	8,068	1,851	2,081	3,766	3,941	295	399
EEC	**322,799**	**1,121**	**131**	**33,623**	**9,700**	**264**	**39,422**	**41,725**	**15,934**	**16,774**	**29,850**	**31,026**	**8,458**	**8,776**
Finland	4,919	46	47	8,305	8,825	445	1,351	1,459	6,504	6,529	7,447	7,549	7,976	7,928
Norway	4,160	22	27	1,830	2,115	314	572	593	1,501	1,457	1,624	1,573	1,978	1,954
Sweden	8,380	55	55	7,885	10,375	504	1,990	1,992	6,272	6,611	7,001	7,357	9,123	9,395
Scandinavia	**17,459**	**123**	**129**	**18,020**	**21,315**	**510**	**3,913**	**4,044**	**14,277**	**14,597**	**16,072**	**16,479**	**19,077**	**19,277**
Austria	7,563	34	15	2,533	1,563	279	1,005	959	1,359	1,330	2,127	2,183	1,321	1,344
Iceland	244	0	0	0	0	245	26	27	0	0	0	0	0	0
Malta	355	0	0	0	0	56	9	9	0	0	0	0	0	0
Switzerland	6,523	29	6	1,135	365	419	1,161	1,243	568	594	1,023	1,087	306	310
Other W.Europe	**14,685**	**63**	**21**	**3,668**	**1,928**	**335**	**2,201**	**2,238**	**1,927**	**1,924**	**3,150**	**3,270**	**1,627**	**1,654**
Total W.Europe	**354,943**	**1,307**	**281**	**55,311**	**32,943**	**298**	**45,536**	**48,007**	**32,138**	**33,295**	**49,072**	**50,775**	**29,162**	**29,707**
Albania	2,968	4	4	15e	15e	12e	16e	16e	10e	10e	10e	10e	10e	10e
Bulgaria	8,989	15	9	520e	260e	130e	530e	530e	360e	360e	440e	440e	215e	215e
Czechoslovakia	15,562	49	22	1,370	1,223	184e	1,279	1,300e	994	1,000e	1,278	1,247	1,116	1,086
Germany Dem. Rep.	16,640	21	19	1,500e	750e	183	1,375	1,381	820	811	1,292	1,327	678	674
Hungary	10,100	10	6	550e	150e	149	665	686	280	249	494	517	92	62
Poland	37,600	48	20	1,500	1,059	80	1,336	1,370	1,025	1,007	1,284	1,320	868	876
Romania	22,772	20	12	850e	750e	67	695e	695e	740e	740e	800e	800e	660e	660e
USSR	275,000	84	57	10,750e	10,000e	74e	9,250e	9,300e	7,600e	7,650e	9,950e	9,975e	8,320e	8,350e
Yugoslavia	23,123	30	21	1,600	950	115	1,201	1,210	957	936	1,340	1,350	845	840
E. Europe	**412,754**	**281**	**170**	**18,655**	**15,157**	**88**	**16,347**	**16,488**	**12,786**	**12,763**	**16,888**	**16,986**	**12,804**	**12,773**
Total Europe	**767,697**	**1,588**	**451**	**73,966**	**48,100**	**185**	**61,883**	**64,495**	**44,924**	**46,058**	**65,960**	**67,761**	**41,966**	**42,480**
NORTH AMERICA														
Canada	25,600	76	34	16,690	24,833	464	5,069	5,396	13,469	14,071	14,439	15,234	20,419	21,686
United States	244,500	561	223	68,601	54,027	638	67,692	70,923	49,753	52,049	60,847	64,416	49,144	51,938
North America	**270,100**	**637**	**257**	**85,291**	**78,860**	**622**	**72,761**	**76,319**	**63,222**	**66,120**	**75,286**	**79,650**	**69,563**	**73,624**
ASIA														
Afghanistan	16,000	0	0	0	0	0e	2e	2e	0	0	0	0	0	0
Bangladesh	101,000	8	9	127e	126e	2	106	113	97	101	104	112	77	81
Bahrain	400	0	0	0	0	33e	6e	6e	0	0	0	0	0	0
Bhutan	1,400	0	0	0	0	2e	1e	1e	0	0	0	0	0	0
Brunei	200	0	0	0	0	33e	3e	3e	0	0	0	0	0	0
Burma	37,000	4	2	35e	35e	3e	47	43	30	26	27	23	30	26
China, Peo. Rep.	1,060,080	1,600e	–	12,000e	8,500e	23	9,693	10,897	6,715	7,152	9,112	9,986	6,186	6,583
Cyprus	700	0	0	0	0	95	30	30	0	0	0	0	0	0
Hong Kong	5,500	3	0	40e	0	336e	840e	840e	5e	5e	40e	40e	0	0
India	700,000	228	–	2,655	1,450	6	1,770	1,994	1,350e	1,340e	1,590	1,800	1,050e	1,050e
Indonesia	175,000	35	16	968	442	10	690	725	500e	560e	506	610	200e	250e
Iran	45,000	17	2	320e	250e	15e	310e	310e	80e	90e	100e	100e	50e	50e
Iraq	15,500	2	2	144	90	10e	70	70e	40e	40e	30e	30e	30e	30e
Israel	4,500	5	0	160	0	199	361	406	65	66	147	155	0	0
Japan	121,672	489	64	24,617	12,617	381	20,301	21,078	11,527	11,765	20,469	21,062	9,279	9,240
Jordan	3,500	1	0	18	0	42	60	66	5	10	15	14	0	0
Kampuchea	6,200	0	0	0	0	1e	2e	2e	0	0	0	0	0	0
Korea, Peo. Rep.	20,000	6	2	100e	80e	10e	90e	90e	50e	60e	80e	80e	50e	60e
Korea, Rep. of	41,569	150e	5	2,858	426	139	2,291	2,615	947	1,027	2,312	2,773	267	287
Kuwait	1,910	1	0	25	0	91e	73e	79e	10e	15e	20e	21e	0	0
Laos	4,000	0	0	0	0	0	1e	1e	0	0	0	0	0	0
Lebanon	2,700	3	0	50	0	83e	110e	102e	5e	5e	45e	42e	0	0
Macao	300	0	0	0	0	29e	4e	4e	0	0	0	0	0	0
Malaysia	15,600	13	1	100e	60e	61e	374	432	45	52	65	73	40	45
Mongolia	1,950	1	1	10e	10e	23e	20e	20e	5e	5e	5e	5e	5e	5e
Nepal	17,130	2	2	7	7	2	17	18	–	2	–	4	–	2
Oman	1,200	0	0	0	0	11e	6e	6e	0	0	0	0	0	0
Pakistan	88,000	15	–	160e	40e	7	309	278	123e	124e	119	107	100e	100e
Philippines	56,000	21	8	436	195	17	367	425	136	176	218	254	93	122
Qatar	300	0	0	0	0	73e	10e	10e	0	0	0	0	0	0
Saudi Arabia	9,000	0	0	0	0	24e	100e	100e	0	0	0	0	0	0
Singapore	2,500	2	0	85	0e	191	220	220	11e	10e	10	10	0	0
Sri Lanka	16,000	2	2	40e	25e	14e	127e	99e	29e	26e	27e	29e	21e	21e
Syria	10,500	3	0	35e	0	17e	80e	80e	10e	10e	5e	5e	0	0
Taiwan	19,479	152	3	3,000	500	288	2,063	2,545	541	600	2,018	2,527	350	394
Thailand	53,000	33	5	630	110	28	630	630e	160	170e	432	432e	40	50e
Turkey	52,000	36	17	800e	540e	33e	748	782e	480	550e	697	730	380	450
United Arab Emirates	1,300	0	0	0	0	10e	6e	6e	0	0	0	0	0	0
Vietnam	60,000	30e	1	120e	90e	2e	60e	66e	50e	55e	55e	60e	20e	25e
Yemen Arab Rep	6,000	0	0	0	0	1e	2e	2e	0	0	0	0	0	0
Yemen Dem. Rep.	2,200	0	0	0	0	2e	2e	2e	0	0	0	0	0	0
Asia	**2,776,290**	**2,862**	**142**	**49,540**	**25,593**	**36**	**42,002**	**45,192**	**23,016**	**24,042**	**38,246**	**41,084**	**18,268**	**18,871**

All figures are metric tons. e = Estimate

1. Import figure includes Luxemburg.

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	Population (1,000)	Number of mills		Capacity (1,000 tons)		Per capita (lb)	Consumption (1,000 tons)				Production (1,000 tons)			
		P & B	Pulp	P & B	Pulp		P & B		Pulp		P & B		Pulp	
							1985	1986	1985	1986	1985	1986	1985	1986
LATIN AMERICA														
Argentina	30,708	100	25	1,250	870	74	871	1,031	632	698	854	991	682	723
Bahamas	200	0	0	0	0	165	15e	15e	0	0	0	0	0	0
Barbados	300	0	0	0	0	61e	7e	7e	0	0	0	0	0	0
Belize	161	0	0	0	0	27e	2e	2e	0	0	0	0	0	0
Bolivia	6,195	1	0	2	0	7e	21e	21e	0	0	1	1	0	0
Brazil	138,493	151	38	4,840	4,416	64	3,599	4,053	2,902	3,096	4,021	4,485	3,776	3,970
Chile	11,882	18	7	433	900	55	290e	297e	334	282	369	388	837	847
Colombia	29,123	24	5	544	258	40	532	528	277	281	447	457	220	234
Costa Rica	2,655	2	1	18	25	99	110	120e	16	18e	12	12e	12	12e
Cuba	10,105	9	3	150e	60e	71e	325e	325e	88e	88e	125e	125e	40e	40e
Dominican Rep.	6,588	2	0	15e	0	22e	65e	65e	4e	4e	9e	9e	0	0
Ecuador	8,884	9	5	65	35	28e	113	113e	47	47e	68	68	25	25
El Salvador	5,072	3	0	50	0	29e	66	67e	10e	12e	28	29e	0	0
Guatemala	8,070	4	1	50	200	26e	95	95e	5	5e	35	35e	0	0
Guyana	798	0	0	0	0	19e	7e	7e	0	0	0	0	0	0
Haiti	5,800	0	0	0	0	2e	6e	6e	0	0	0	0	0	0
Honduras	4,500	0	0	0	0	14e	29e	29e	0	0	0	0	0	0
Jamaica	2,428	1	0	20	0	41e	45e	45e	0	0	15	15	0	0
Mexico	81,000	64	15	3,316	957	65	2,515	2,405	1,131	1,113	2,448	2,470	820	772
Neth. Antilles	300	0	0	0	0	22e	3	3	0	0	0	0	0	0
Nicaragua	3,038	0	0	0	0	18e	24e	24e	0	0	0	0	0	0
Panama	2,038	3	0	30	0	88e	82e	82e	1e	1e	27	27e	0	0
Paraguay	3,722	3	0	25e	0	15e	26e	26e	0	0	13e	13e	0	0
Peru	19,532	14	4	351	311	22e	197	199e	113	113e	150	152e	73	73e
Suriname	400	0	0	0	0	61	11	11	0	0	0	0	0	0
Trinidad/Tobago	1,185	0	0	0	0	15e	8	8	0	0	0	0	0	0
Uruguay	3,000	5	2	60e	30e	37	50	51	34	31	41	54	26	24
Venezuela	18,000	12	3	791	175	94	724e	767e	281	308	550	611	68	88
Latin America	**404,177**	**425**	**109**	**12,110**	**8,237**	**57**	**9,838**	**10,402**	**5,875**	**6,097**	**9,213**	**9,942**	**6,579**	**6,808**
AUSTRALASIA														
Australia	16,000	18	18	1,700	1,225	320	2,349	2,325	1,036	1,073	1,564	1,642	860	870
Fiji	700	0	0	0	0	22e	7e	7e	0	0	0	0	0	0
New Zealand	3,331	6	6	802	1,401	347	593	525	727	629	770	671	1,145	1,110
Papua New Guinea	3,500	0	0	0	0	4e	6	6e	0	0	0	0	0	0
Samoa	200	0	0	0	0	33e	3e	3e	0	0	0	0	0	0
Australasia	**23,731**	**24**	**24**	**2,502**	**2,626**	**266**	**2,958**	**2,866**	**1,763**	**1,702**	**2,334**	**2,313**	**2,005**	**1,980**
AFRICA														
Algeria	22,025	6	3	160e	170e	18e	170e	180e	90e	95e	100e	110e	30e	35e
Angola	7,950	2	1	30e	45e	5e	19e	19e	15e	15e	15e	15e	15e	15e
Benin	400	0	0	0	0	2e	4e	4e	0	0	0	0	0	0
Botswana	1,100	0	0	0	0	2e	1e	1e	0	0	0	0	0	0
Burkina Faso	6,900	0	0	0	0	0	1e	1e	0	0	0	0	0	0
Burundi	4,600	0	0	0	0	0	1e	1e	0	0	0	0	0	0
Cameroon	9,800	0	0	0	0	2e	10e	10e	0	0	0	0	0	0
Central African Rep.	2,700	0	0	0	0	1e	1e	1e	0	0	0	0	0	0
Chad	5,200	0	0	0	0	0e	1e	1e	0	0	0	0	0	0
Congo	1,800	0	0	0	0	1e	1e	1e	0	0	0	0	0	0
Egypt	49,000	16	3	180	60	20e	449e	449e	65e	65e	149e	149e	42e	42e
Ethiopia	42,289	1	0	12	0	1e	19	20e	4	4e	9	10	0	0
Gabon	900	0	0	0	0	5e	2e	2e	0	0	0	0	0	0
Gambia	800	0	0	0	0	6e	2e	2e	0	0	0	0	0	0
Ghana	13,200	0	0	0	0	2e	9e	9e	0	0	0	0	0	0
Guinea	5,700	0	0	0	0	2e	4e	4e	0	0	0	0	0	0
Guinea-Bissau	900	0	0	0	0	2e	1e	1e	0	0	0	0	0	0
Ivory Coast	10,056	1	0	40	0	13e	60e	60e	0	0	30	30	0	0
Kenya	19,000	5	1	80	60	14e	119	119e	57	57e	108	108e	53	53e
Lesotho	1,500	0	0	0	0	2e	1e	1e	0	0	0	0	0	0
Liberia	2,200	0	0	0	0	1e	1e	1e	0	0	0	0	0	0
Libya	4,000	10	0	10e	0	12e	21	21	6	6	6	6	0	0
Madagascar	10,000	2	2	19	7	2	11	11	9	11	11	11	5	5
Malawi	6,000	0	0	0	0	4e	12e	12e	0	0	0	0	0	0
Mali	7,700	0	0	0	0	0	1e	1e	0	0	0	0	0	0
Mauritania	1,700	0	0	0	0	5e	4e	4e	0	0	0	0	0	0
Mauritius	1,000	0	0	0	0	13e	6e	6e	0	0	0	0	0	0
Morocco	24,000	8	1	130	100	17	178	180	48	32	107	109	81	81
Mozambique	13,776	2	0	10e	0	3	17e	17e	3e	3e	2e	2e	0	0
Niger	6,500	0	0	0	0	1e	3e	3e	0	0	0	0	0	0
Nigeria	95,000	5	2	170	140	9	434	403	60	43	57	77	17	31
Rwanda	6,200	0	0	0	0	2e	4	5	0	0	0	0	0	0
Senegal	6,600	0	0	0	0	1e	4	4e	0	0	0	0	0	0
Sierra Leone	3,900	0	0	0	0	1e	1e	1e	0	0	0	0	0	0
Somalia	7,600	0	0	0	0	1e	2e	2e	0	0	0	0	0	0
South Africa	32,465	17	10	1,950e	2,160e	88e	1,293	1,295e	1,345e	1,445e	1,510	1,611e	1,725e	1,875e
Sudan	21,500	2	0	10	0	6	64	55	0	0	9	9	0	0
Swaziland	700	0	1	0	180	6e	2	2	0	0	0	0	174	180
Tanzania	21,733	2	2	60	60	5e	45e	45e	5e	5e	20	20	0	0
Togo	3,000	0	0	0	0	0	02	0.2	0	0	0	0	0	0
Tunisia	7,352	5	1	30e	20e	27e	90e	90e	30e	30e	30e	30e	20e	20e
Uganda	14,733	1	0	5e	0	1e	7e	7e	3e	3e	2e	2e	0	0
Zaire	32,985	1	0	4e	0	1e	10e	10e	2e	2e	2e	2e	0	0
Zambia	6,770	1	0	10	0	7e	26e	26e	0	0	6e	6e	0	0
Zimbabwe	8,400	3	2	90	49	22	78	82	57	55	73	75	32	32
Africa	**551,634**	**90**	**29**	**3,000**	**3,042**	**13**	**3,189**	**3,169**	**1,799**	**1,871**	**2,246**	**2,382**	**2,194**	**2,369**
TOTAL WORLD	**4,793,611**	**5,626**	**1,012**	**226,409**	**166,458**	**93**	**192,631**	**202,443**	**140,599**	**145,890**	**193,285**	**203,132**	**140,575**	**146,132**

TOP 20 PRODUCING NATIONS

Taiwan

Population: 19,479,000. Per capita consumption of paper and board: 131 kg/288 lb. Paper and board mills: 152. Pulp mills: 3 (sulfate: 2; non-wood: 1).

Paper/board capacity: 3,000,000 tons. **Pulp capacity:** 500,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	1,560	1,917	138	155	45	69
Board	458	610	0	12	48	80
Total	**2,018**	**2,527**	**138**	**167**	**93**	**149**
Chemical woodpulp	342	383	247	282	75	107
Other pulps	8	11	20	32	1	1
Total	**350**	**394**	**267**	**314**	**76**	**108**

United Kingdom

Population: 56,620,000. Per capita consumption of paper and board: 142 kg/312 lb. Paper and board mills: 96. Pulp mills: 6 (semichemical: 2; mechanical: 2; non-wood: 2).

Paper/board capacity: 4,162,000 tons **Pulp capacity:** 427,000 tons
Operating rate 1986: 95% **Operating rate 1986:** 93%

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	2,639	2,872	3,744	3,817	320	367
Board	1,127	1,069	860	940	254	263
Total	**3,766**	**3,941**	**4,604**	**4,757**	**574**	**630**
Chemical woodpulp	295	399	1,339	1,465	1	3
Other pulps	—	—	220	222	2	2
Total	**295**	**399**	**1,559**	**1,687**	**3**	**5**

United States

Population: 244,500,000. Per capita consumption of paper and board: 296 kg/651 lb. Paper and board mills: 561. Pulp mills: 223 (sulfate: 201; sulfite: 18; semichemical: 35; mechanical: 45).

Paper/board capacity: 68,601,000 tons **Pulp capacity:** 54,027,000 tons
Operating rate 1986: 94% **Operating rate 1986:** 92%

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	50,867	53,824	9,992	10,256	2,420	2,887
Board	9,980	10,592	62	95	789	957
Total	**60,847**	**64,416**	**10,054**	**10,351**	**3,209**	**3,844**
Chemical woodpulp	43,316	45,767	3,792	3,878	2,868	3,378
Other pulps	5,828	6,171	259	278	574	667
Total	**49,144**	**51,938**	**4,051**	**4,156**	**3,442**	**4,045**

U.S.S.R.

Population: 275,000,000. Per capita consumption of paper and board: 34 kg (e) /75 lb. Paper and board mills: 84. Pulp mills: 57

Paper/board capacity: 10,750,000e tons **Pulp capacity:** 10,000,000e tons

(000 metric tons)

	Production		Imports		Exports	
	1985	**1986**	**1985**	**1986**	**1985**	**1986**
Paper	5,960	5,985	534	534	1,028	1,030
Board	3,990	3,990	166	166	372	370
Total	**9,950**	**9,975**	**700**	**700**	**1,400**	**1,400**
Chemical woodpulp	6,720	6,750	350	350	1,070	1,070
Other pulps	1,600	1,600	—	—	—	—
Total	**8,320**	**8,350**	**350**	**350**	**1,070**	**1,070**

plan. Paper and board output rose 16% to 723,000 tons.

Turning to Central America, the industry stays in the doldrums. Mexico's most severe economic crisis in recent times, sparked by the fall in oil prices at the end of 1985, led to a 3.9% decrease in GNP. Paper and board output rose only 1% to 2.47 million tons, helped by strong exports, which totaled 5.5% of production. Pulp output fell 6% to 772,000 tons, due to the closure of uneconomical pulp lines. In 1987, GNP is set to return to a positive growth rate of 2% to 3%, but inflation is still set to stay above 100%. Demand growth for paper and board is expected to return to a normal growth rate of 4% to 5%.

EUROPE

THE TOTAL PAPER AND board output for Europe, West and East combined, rose by 2.7% in 1986 to a new record level of 67.8 million tons. Pulp output also climbed by 1.2% to 42.5 million tons. It was Europe's fifth successful year in a row, and it seems that a major period of expansion lies ahead—especially in newsprint and printing/writing grades—as companies plough profits back into new paper machines.

The 12 nations of the European Community (Spain and Portugal became members of this group on Jan. 1, 1986) enjoyed a highly successful 1986. The biggest papermaking nation and the biggest market in the EEC, Fed. Rep. Germany, had a 6.2% rise in apparent consumption. Due to the high international value of the deutschemark, two-thirds of the increase was fueled by imports. Output rose by 2.5% to 9.4 million tons and exports were 3.0 million tons, up 4.7%. The period to 1989 will see the startup of one major new lightweight coated (LWC) line and big investments in the coated woodfree paper sector as well.

In France, there are finally signs of a return of investment capital in the industry after a period of stagnation since 1980. Consumption was up by 6.0%, production by 4.5% to 5.6 million tons, and imports by 11.0%. The year ahead will see some important startups in the newsprint and coated paper sectors. In the U.K. papermaking is also reviving and entering a period of cautious growth. Output of paper and board in 1986 was 4.6% to 3.94 million tons, with newsprint and woodfree printing/writing accounting for the increase. By end-1989, the U.K. will have started its first LWC line and at least one, and possibly two, 180,000-tpy newsprint machines.

Italy, the EEC's other big market, showed growth in paper and board output of 1.1% to 4.64 million tons. Some rationalization of the industry's chaotic structure, especially in the printing/writing is beginning to occur.

New members, Spain and Portugal, have boosted the EEC's self-sufficiency in pulp and pulpwood for papermaking and in kraftliner. Also, the low costs of production in these countries drew in investment during 1986, and considerable interest is being shown for the future by countries outside the EEC that hope to obtain manufacturing bases there.

For the Nordic countries, Sweden, Finland and Norway, 1986 was also a generally successful year for the paper and board makers, with total output rising by 2.5% to 16.5 million tons. Total pulp production rose 1.0% to 19.3 million tons. Market pulp mills, however, were hit by the slide in the dollar's value against European currencies.

The year was marked by continued restructuring. In Sweden, Stora made a successful bid for the Papyrus group, becoming one of the world's ten biggest paper companies. In Finland, Metsäliiton Teollisuus merged with G.A. Serlachius to form Metsä-Serla. Early in 1987, Ahlström sold its Varkaus mill to Enso-Gutzeit.

It was also a year of innovation, with two Finnish companies developing new machine-finished lightly coated pigments (MFP) grades for the European market. In the grade spectrum, they are designed to fit between LWC and supercalendered (SC) in quality and price.

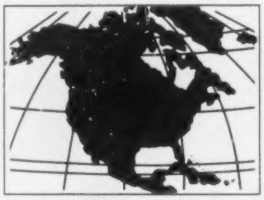
Some important startups are scheduled for the period to 1989. Two 200,000-tpy newsprint machines are set to start up in Sweden, while in Finland a new 180,000-tpy LWC line is set for startup late this year. Norwegian producers are investing $600 million, mainly in newsprint and magazine papers.

Other important investments outside the EEC included the startup in Austria in April this year of a new coated woodfree printing paper machine with a capacity of 140,000 tpy.

The buildup of capacity outside the EEC but targeted on its national markets has caused considerable concern in the past 12 months. The EEC paper mills' confederation Cepac believes that investment decisions, especially in European Free Trade Assn. (EFTA) countries, will add massively to overcapacity and will damage the competitiveness of EEC producers. The grades which are experiencing the biggest buildup in capacity are coated wood-containing papers, especially LWC. Cepac is monitoring imports and may ask the government of the EEC to take action at a later stage.

In eastern Europe, 1986 was not a successful year for the pulp and paper industry. Production was static at around 16.9 million tons. Several big problems confront the industry, among them: sluggish economies and a lack of paper machine building capacity.

For the present, attention is being concentrated on improving mill efficiency by more use of process control and a decentralization of the management of the industry. For the future, it seems that progress will be centered on opening up the vast forest resources of the U.S.S.R., at first in the hardwood-growing regions of the European part of the country, and later in the Far East of the country and in Siberia. This however, will take time and considerable funds.



NORTH AMERICA

TOTAL PAPER AND BOARD production in North America in 1986 was 79.65 million tons, 3.9% above the all-time record set in 1984 and 5.3% above 1985 levels. The U.S. industry enjoyed strong domestic and offshore demand. Paper and board production in 1986 reached 61.4 million tons, 5.9% ahead of 1985 and 3.7% above 1984's record amount. Exports jumped 19.7%, helped by the strong dollar. Imports of paper and board were up 3.6%.

Output of market pulp climbed to 6.7 million tons, 11% ahead of 1985. Domestic demand rose 5.9%. Pulp exports soared 17.5% while imports inched up 2.6%.

The stellar performers were printing/writing paper and kraft linerboard. Uncoated free-sheet output rose by 7.4%. Coated free-sheet producers made 6.6% more paper than in 1985. Production was spurred by strong demand from commercial printers and increased demand for forms bond and other writing papers from offices.

Production of unbleached kraftliner set a new record at 14.9 million tons--7.9% above the year-earlier level. Demand for corrugated shipping containers increased 6%. The export market for linerboard was particularly strong. Exports of this grade increased 13.6%.

Imports of paper and board strengthened in the first quarter of this year, rising 8.6% compared with an 8.4% increase in exports. Woodpulp exports increased 8.2% compared with first-quarter 1986. Imports of woodpulp rose 16%, reflecting a rise in shipments from Canada.

Shipments of pulp and paper from the Canadian industry rose 7% in 1986 to 23.3 million tons, besting 1985's record year by 1.5 million tons. As was the case in 1985, printing/writing grades showed the largest increase, with shipments rising 12% from 1985. Exports of woodpulp and shipments of packaging paper and board rose by 10% while newsprint shipments increased 3%.

The industry as a whole operated at 94% capacity in 1986. The Canadian industry was aided by the weak Canadian dollar. Compared with 1985, the Canadian dollar in 1986 was worth 35% less vis-a-vis the German mark and 20% less than the Swedish crown. This led to a 13% increase in offshore shipments. Shipments to Europe rose 25% and shipments to Japan were up 15%.

1987 will be a red-letter year for the North American industry. Operating rates in Canada are expected to reach 98%. Total shipments are anticipated to rise 5% this year to 24.3 million tons. Shipments to the U.S. are expected to grow 6%.

The U.S. industry, in the first quarter was producing paper and board at an annual rate of 65.3 million tons, 4.1% ahead of the year-earlier quarter. Output of chemical paper-grade market pulp rose 7.8% in the quarter. ■

PAPER INDUSTRY LEADERS CROWD SYMPOSIUM ON INTERNATIONAL TRADE

Trying to chart a profitable course for the 1990s, experts worry about growing protectionism, flattening demand, and currency fluctuations

By REGINA McGRATH, Assistant News Editor

Industry leaders from around the world met in May in an effort to gauge where certain discernable trends will lead pulp producers and papermakers in the next decade and beyond. Most of the attendees at the international symposium "Global Issues & Outlook in Pulp & Paper," sponsored by the Univ. of Washington, Seattle, Wash., asserted that they need a "level playing field" in which to do business, but not everyone agreed on exactly what that entails.

What most attendees did agree on, however, is that we haven't yet seen the end of the trend toward consolidation. More mergers will occur worldwide since the return on investment in building greenfield mills is too low in the mature industries (North America, western Europe, Scandinavia, Japan). Thus, most companies will be able to increase their market share only through acquisitions. In some cases, this has the added benefit of providing economies of scale. Companies will also specialize more as they try to dig a niche for themselves in increasingly competitive worldwide markets. Local markets will become less isolated, and customers' growing sophistication will lead them to buy the best available products at the lowest cost, regardless of which country makes the product.

THE MATURE COUNTRIES. Several speakers noted that paper consumption in the mature countries is not expected to grow substantially. This is a particular worry for the U.S., where imports remain at high levels despite the fall in the dollar's value. However, Furman C. Moseley, chairman of Simpson Paper Co., said that he is optimistic about the U.S. pulp and paper industry. He pointed out that many companies have slimmed down and rationalized operations, enabling them to more effectively compete in world markets. He also suggested that the new tax law could benefit the industry in the sense that capacity will now be built on an as-needed basis. He was even optimistic that the U.S. would be able to rectify its balance-of-payments problem in the near future.

Due to the high cost per ton of production, Moseley said that U.S. industry is ripe for a revolution in products and processes. He cautioned that two major factors could limit U.S. growth: exchange rate fluctuations and fast-growing plantations abroad. The U.S. should be able to maintain its domestic market, however, and the West Coast has a good jump on carving a substantial piece of the Pacific Rim pie, Moseley noted.

David Clark, executive director of the European Paper Institute, was worried about the high level of international debt, the unpredictable nature of currency fluctuations, and the high level of unemployment in many European countries. Like the U.S., Europe is now more dependent on economic growth than it previously had been. While the volume of trade has gone up western Europe, most of this is intraregional. According to EPI statistics, about half of the paper produced in Europe is exported from the producing country, but most of it stays in Europe. Europe remains a net importer of pulp, and it bought about 5 million tons of pulp from offshore sources in 1986.

Clark noted that capacity expansions in both newsprint and coated groundwood paper are coming on faster than is warranted by demand growth. This will force European producers to place more emphasis on exports outside of Europe and will probably result in increased downtime for producers. He emphasized that the U.S. market will be "crucial" to Europe.

Jiro Kawake, president of Oji Paper Co. Ltd. of Japan, also underlined the importance of the U.S. to his country, but aside from its dependence on U.S. woodchips, Japan's industry seems to be more interested in buying mills in the U.S., particularly since the yen is so strong relative to the U.S. dollar (Table 1). Although Japan is the second-largest paper producer and consumer after the U.S., its lack of large timber resources makes it heavily dependent on wastepaper. Kawake noted that about half of the fiber Japan consumes comes from recycled wastepaper, and about 60% of its pulpwood comes from domestic sources.

Kawake estimated that current paper and board capacity in Japan exceeds domestic demand by about 15%. But he believes that since domestic demand is expected to grow at an annual rate of 2.4%, demand and supply will be balanced in the next five years. Kawake did not indicate where raw materials to support this expansion would be found, but he observed that Japan must consider importing finished products from projects developed abroad.

He noted that Settsu Corp.'s 21.5% ownership of Caraustar Industries Inc. is an example of such a development. It is also widely known that Daishowa Paper Mfg. Co. Ltd. is looking to buy a linerboard mill somewhere in the U.S. since its deal with Louisiana-Pacific Corp.'s Antioch, Calif., mill fell through this summer. More of Japan's industry may follow the lead of Kanzaki Paper, which purchased the former Ludlow mill in Ware, Mass., and is producing thermal and adhesive paper there for sale in the U.S. market.

FAST-GROWING PLANTATIONS. As Ron Aurell, senior vice president of Jaakko Poyry International Oy of Finland, observed in his keynote address, the main cost of making pulp and paper is wood, and mills have traditionally moved closer to cheaper wood supplies. During the next ten years, the increasing cost-competitiveness of market pulp mills in Brazil, South Africa, Chile, and New Zealand, among others, will enable these countries to dominate the world market for pulp.

Jose Luiz Paoliello, general sales manager of Cenibra in Brazil, estimated that an additional 1.5 million metric tpy of pulp would come onstream in the 1990s if all of Brazil's expansion plans come to fruition. Brazilian market pulp producers are frustrated in their attempts to earn foreign currency because the country's domestic paper industry is demanding increasing amounts of pulp to keep pace with soaring paper demand. Both the government and the World Bank are interested in seeing Brazil earn dollars to pay off its huge foreign debt, however, so it is expected that foreign funds will help Brazil expand its pulp output.

Paoliello rejected warnings that eucalyptus pulp will be in oversupply soon, calling this an "imaginary fear." He noted that Brazil's mills are highly cost-efficient due to the low wood costs they enjoy from the country's fast-growing plantations (eucalyptus can be harvested after seven years). Demand for eucalyptus pulp will continue to grow because hardwood pulp gives better formation, higher brightness, and better bulk than softwood pulp.

TABLE 1: **Overseas projects by Japanese companies.**

Japanese companies	Ownership	Name of venture	Local shareholders		Date established	Location	Production (pulp, paper)	Share of product imported by Japan
Honshu Paper Mitsubishi Corp.	32.24% 32.24	Crestbrook Forest Industries	Public	(35.52%)	1/1967	Skookumchuck, B.C., Canada	BSKP 560 MT/D	about 25%
Jujo Paper	14	Finlay Forest Industries	BCFP Cattermole	(43%) (43%)	11/1968	Mackenzie, B.C., Canada	RMP 450 MT/D	0 (after 1984)
Daishowa Paper Marubeni Corp. (through Daishowa-Marubeni International, Ltd.)	50	Cariboo Pulp & Paper	Weldwood of Canada	(50%)	4/1970	Quesnel, B.C., Canada	BSKP 750 MT/D	50%
Ohi Paper Sanyo-Kokusaku Pulp	35 5	Carter Oji Kokusaku Pan Pacific	Carter Holt Harvey	(60%)	5/1971	Napier, New Zealand	TMP 700 MT/D	100%
Japan Brazil Paper & Pulp Resources Development Co. (established by Overseas Economic Cooperation Fund and 19 companies)	48.42	Celulose Nipo-Brasileira	Companhio Vale do Rio Doce	(51.48%)	9/1973	Ipatinga, Minas Gerais, Brazil	BHKP 750 MT/D	50% (minimum)
Daishowa Paper (through Daishowa Canada Co., Ltd.)	50	Quesnel River Pulp	West Fraser Mills	(50%)	4/1977	Quesnel, B.C., Canada	TMP 500 MT/D	25%
Jujo Paper	10	North Pacific Paper	Weyerhaeuser	(90%)	8/1976	Longview, Wa., U.S.A.	Newsprint 1,200 MT/D	50%
Oji Paper Mitsui & Co.	25 8	NBIP Forest Products	CIP Inc.	(67%)	6/1980	Dalhousie, N.B., Canada	Newsprint, Publication Paper 1,000 MT/D	110,000 MT/Y (about one third)

Note: BSKP = Bleached Softwood Kraft Pulp
BHKP = Bleached Hardwood Kraft Pulp
RMP = Refiner Groundwood Pulp
Source: *Pulp & Paper Statistics* by Japan Paper Association and *Overseas Investment by Japanese Companies* by Toyokeizai Shinpousha.

Many producers of tissue and printing and writing paper prefer this pulp, and these are the areas in which demand, particularly in the lesser-developed countries, will be the strongest.

Roger Wiewel, who is senior vice president-marketing group, MacMillan Bloedel Ltd., said his company was using Brazilian eucalyptus pulp to produce some of its fine papers. He also conceded that Chile has an economic advantage in growing softwood. However, Wiewel revealed that studies are now being conducted by the Univ. of Washington on growing poplar in the Pacific Northwest to compete with fast-growing plantations. Preliminary results are encouraging, but more investment is needed to develop this area. Meanwhile, Wiewel foresees that the Canadian industry will have to export more paper and pulp, especially white paper, newsprint, and market pulp, to stay competitive. He predicted that Canada will continue to build more chemi-thermomechanical pulp (CTMP) projects because of their high return on fiber.

The situation is similar in Sweden, where intensive research is being done on high-yield thermomechanical (TMP) and CTMP to enable Swedish mills to get the most out of their limited fiber resources. Bo Wergens, president of the Swedish Pulp & Paper Assn., said that insidious deterioration of tree growth rates in Sweden is "very alarming," and called for an international effort to solve the problem.

THE SUBJECTIVE NOTION OF FREE TRADE. International consensus was not evident in discussions on free trade. Talk of free trade was guaranteed to offend someone at any given time. U.S. notions of free trade certainly do not jive with Canada's, and the U.S. trade imbalance with Japan was alluded to more than once, to the discomfort of both the Japanese and the Americans.

After giving the U.S. perspective on paper trade (see *P&P*, May 1987, p. 214), Irene Meister, vice president-international of the American Paper Institute, was asked if a universal open-trade system is a possibility. She replied that there is general recognition within the Reagan administration and among some members of Congress that even if all trade barriers were removed it would only rectify 15% to 20% of the trade imbalance. However, Meister additionally noted that this margin is crucial to the U.S. as a free trader. She observed that paper consumption depends on the level of economic development in other countries, and this economic development is ultimately hampered by tariffs as well as other protectionist measures.

This last point was underscored by some statistics given by Philip Wardle, senior forestry economist of the Food & Agriculture Organization. While average world paper consumption per capita is 40 kg/year, developing countries average 7 kg. This compares with 300 kg in the U.S. Small wonder that one of the United States' largest exports is wastepaper.

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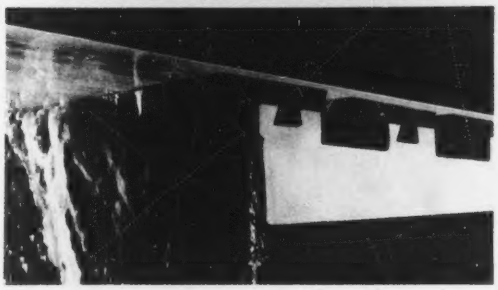

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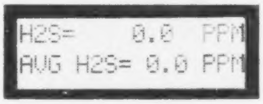

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EXPANSION/MODERNIZATION

CROWN FOREST'S NO. 5 NEWS MACHINE CONSISTENTLY THE WORLD'S FASTEST

Ever since the Elk Falls mill's startup in 1982, papermakers have been working to improve speed, efficiency, and product quality

By KENNETH E. SMITH, Executive Editor

Although the mill's origin can be traced back to 1950, Crown Forest Industries Ltd.'s Elk Falls mill near Campbell River, B.C., boasts a number of superlatives thanks to almost continuous expansion and modernization by its previous and current owners. Today, the Elk Falls mill can claim to have North America's largest hogged-fuel-burning power boiler, North America's largest thermomechanical pulp (TMP) plant, and the world's fastest newsprint machine. More than C$500 million has been spent on the mill in the last decade. Currently under way is a C$25-million project to add a seventh TMP line and increase overall TMP production to 1,600 metric tpd by mid-1988. The TMP screening system is being improved as well. Also under way is a project to convert the mill's one remaining fourdrinier newsprint machine, No. 2, to a twin-wire configuration. When these two projects are complete, Elk Falls newsprint production should rise to 500,000 metric tpy on three twin-wire machines.

In addition to quantity, Elk Falls turns out high-quality products. Its newsprint is consistently rated as having the best runability in western North America, according to pressroom reports. However, the mill has recently been in the news because its No. 5 Valmet Sym-Former N machine set a new world speed record of 1,318 m/min (4,324 fpm) sustained for more than 40 hours. During that run the peak speed was 1,322 m/min (4,337 fpm). No. 5 machine, which trims 335 in., consistently appears among the top three in the Canadian Pulp & Paper Assn.'s rankings of the world's most productive newsprint machines (based on kg production/cm trim). No. 5 produces 40 to 52 g/m² weights with a furnish of approximately 86% TMP and 14% semi-bleached kraft. According to Crown Forest vice president and resident manager Bill Sharkey, a more typical performance for No. 5 would be on the average a speed of 1,280 m/min (4,199 fpm) and a daily production rate in excess of 600 metric tons.

GRADUAL SPEEDUP. No. 5 was started up in January of 1982 when state-of-the-art for newsprint machines meant operating at 3,500 fpm. However, according to Sharkey, the Crown Forest team had carefully studied newsprint production technology around the world and had the machine designed so that its major components would be capable of operating at 4,000 fpm. Crown Forest personnel—Sharkey says everyone in the mill deserves credit—have brought the machine gradually up to higher speeds during the past five years without major mechanical modifications. Suction blowboxes have been installed, and the first two dryer sections have been converted to serpentine felt runs. A new Valmet SymFlo headbox was also installed. Felt and wire suppliers have worked closely with Crown Forest to supply clothing capable of operating at higher speeds. But Sharkey credits the expertise of the machine crews for achieving the increased speeds. "The combination of having a machine with the potential to operate at higher speeds and the skills of our papermaking people have enabled us to push the speed up. It has been the ingenuity of our papermakers that has solved the various problems of operating at higher speeds," he says. Sharkey

TABLE 1: **Canadian Pulp & Paper Assn.'s top ten most productive newsprint machines, 1986.**

Company	Mill Location	Machine No.	Kg Production—Cm Trim
Smurfit Newsprint	Newberg, Ore.	No. 2	717.9
Bowater Southern	Calhoun, Tenn.	No. 5	708.8
Crown Forest	Elk Falls, B.C.	No. 5	703.2
Holmens Bruk	Braviken, Sweden	No. 51	689.1
B.C. Forest Products	Crofton, B.C.	No. 3	676.0
Kajaani Oy	Kajaani, Finland	No. 4	670.5
Holmens Bruk	Braviken, Sweden	No. 52	666.3
Smurfit Newsprint	Newberg, Ore.	No. 1	648.2
Rauma-Repola	Rauma, Finland	No. 3	647.3
Augusta Newsprint	Augusta, Ga.	No. 2	635.0

also feels that No. 5's potential is yet to be fully tapped. "With a little more work, we'll be able to sustain these impressive operating rates."

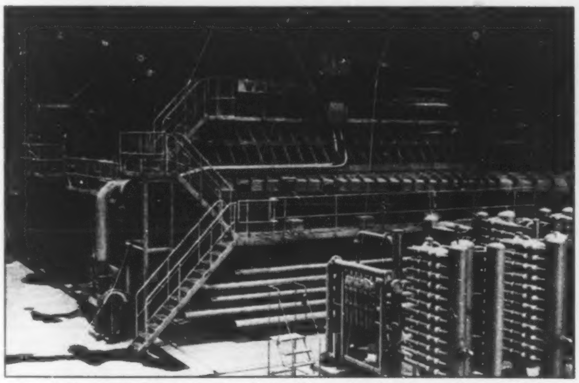
One of the unique features on No. 5 machine is the rubber-covered roll running in the center roll position on the machine's Sym Press II press section. The original granite center roll was replaced after it was found to be cracked. The rubber-covered replacement roll was manufactured by Valmet-Dominion, and Sharkey believes that Crown Forest is the only mill currently running with this unique type of configuration. Loadings in the three nips are 420, 450, and 620 pli, respectively. The section is additionally equipped with a Valmet steam box (29 adjustable zones) in the second press suction roll holding zone. Dryness out of the third press is 40% to 41%.

COMPANY HISTORY. The mill was originally built as a greenfield mill and started up in 1952 by the Elk Falls Co., which was a partnership between Canadian Western Lumber Co. Ltd. and Pacific Mills Ltd. In 1953 the Elk Falls Co. became a division of Crown Zellerbach Canada Ltd. In 1983, Crown Zellerbach Canada was purchased by Fletcher Challenge Ltd. of New Zealand, and the name was changed to Crown Forest.

In addition to newsprint, Crown Forests' versatile mill is able to produce 190,000 metric tpy of bleached and semibleached kraft market pulps. Its Elk Prime product is a fully bleached pulp manufactured from "mini-chip" (sawdust and residuals) British Columbia coastal softwood species. With an annual capacity of 160,000 metric tons, Crown Forest is the largest manufacturer of this product worldwide. Elk Prime is produced by M&D digesters then followed by bleaching and is said to exhibit properties of both softwood long-fiber and hardwood short-fiber pulps. Elk Prime is used as a substitute for hardwood where strength is desirable, can be used as a softwood pulp extender, and is used in the manufacture of printing and writing papers, tissue, toweling, and duplex linerboard. The Elk Falls mill also produces approximately 30,000 metric tpy of A16 semibleached market pulp primarily for newsprint use.

The mill's No. 4 machine has a 174-in. trim and produces 86,000 metric tpy in 25 different grades used for silver liner, natural liner, and medium; bleached and unbleached multiwall bags; checkstand and grocery bags, as well as specialty paper grades (saturating kraft, gumming, filter paper, butcher paper, and dissolving core stock). Most of this production is used internally by Crown Forest's packaging division located in Richmond, B.C.

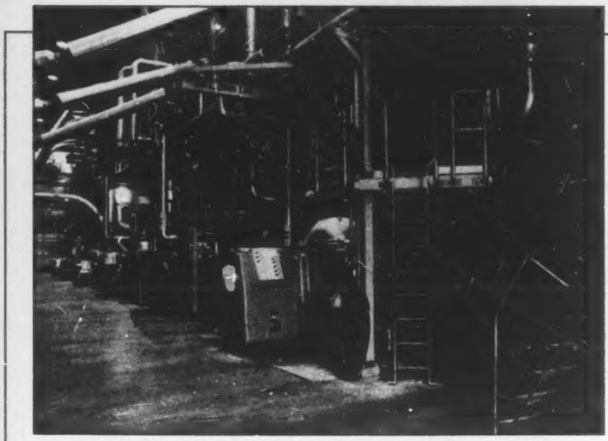
Elk Falls' recently modernized kraft pulp mill consists of eight batch digesters, a Kamyr and two M&D continuous digesters. All wood used by both the TMP and kraft pulp mills is in the form of sawmill residuals. The mill is also a large consumer of hogged fuel with one boiler that produces 450,000 lb/hour of steam without auxiliary fuel. The company either owns or manages more than 2,000 square miles of prime British Columbia forestland.


Crown Forest's No. 5 is consistently ranked among the world's top three most productive newsprint machines.

TMP MILLS. The Elk Falls mill has been a pioneer in the use of TMP for newsprint production for several reasons, including cheap hydroelectric power, management's desire to use sawmill residuals for pulping, and its efforts to improve newsprint quality. The first TMP installation at Elk Falls was in 1978 and consisted of a 450-tpd, three-line plant. Each line consisted of a primary and a secondary RLP 54/58S refiner supplied by Defibrator. The refiners are driven by a single 10,000-hp motor and have 58-in.-dia discs. In 1981-82, a 900-tpd addition was made to support No. 5 newsprint machine and to replace the groundwood mill. This consisted of three lines of two CD-70 conical disc refiners plus reject refining supplied by Sunds Defibrator. These refiners have discs with an independently adjustable conical section at the periphery and are each driven by a single 20,000 hp motor.

Sunds Defibrator and Crown Forest have worked closely to improve refiner control. Each refiner was fitted with Sunds' True Disc Clearance (TDC) sensors at installation. Sunds Defibrator, Crown Forest, and Univ. of Idaho have done extensive studies to model the relationship between refining intensity and high-frequency vibration, as reported by B.C. Strand and A. Mokvist at the recent 1987 International Mechanical Pulping Conference in Vancouver, B.C. Using process models describing the performance of the CD 70 refiners, Crown Forest installed and tested an online monitoring and analysis system at Elk Falls. Conclusions drawn from the study include the finding that refining intensity is a significant refining variable that affects the pulp quality-specific energy relationship. It was estimated that a large portion (40% to 45%) of the normally observed variation in pulp quality can be attributed to changes in refining intensity, while a smaller portion (15% to 20%) can be attributed to specific energy changes.

Using detailed analysis of the vibration signals from accelerometers mounted on the backside of stator plates on a CD refiner, Crown Forest identified three different



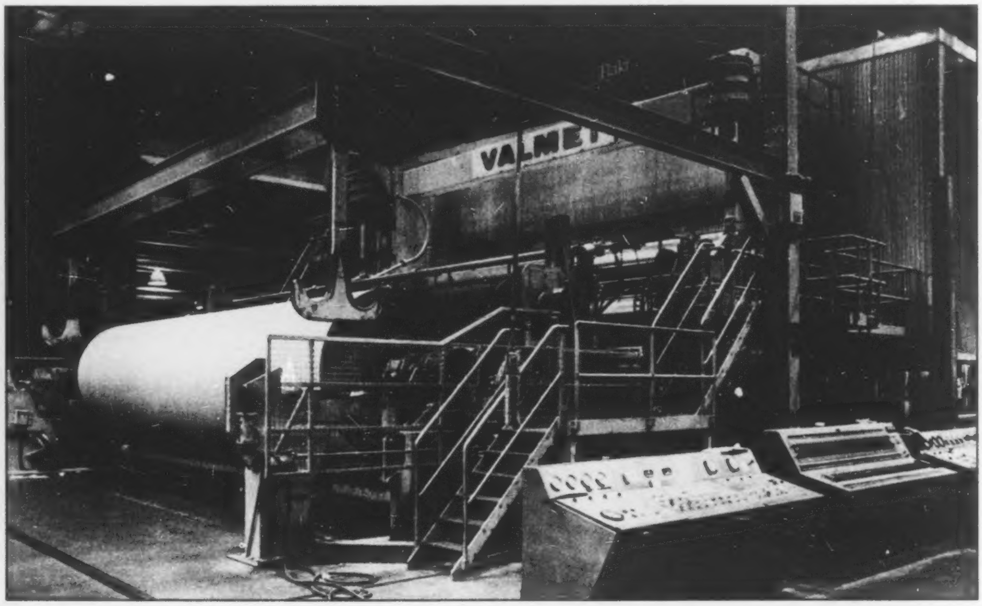
Elk Fall's TMP mill is the largest in North America—soon to reach 1,600 metric tpd.

phenomena that affect pulp quality: the energy split between the flat and conical zones, the plate condition, and the degree of fiber cutting. Based on process models that predict refiner performance in terms of these variables, the online monitoring and analysis system was developed and installed. The purpose of the system is to monitor the power split and plate condition, analyze this information and supply additional information to the operators for online setpoint optimization. This system should also allow operators to control total TMP mill power load by changing chip flow, chip moisture content, or kWh/ton without affecting pulp quality. This should minimize power required to reach a given quality window.

SATISFYING THE CUSTOMERS. Crown Forest, according to Sharkey, is a customer-oriented company. Its major newsprint customers are located in the 13 western states in the U.S. This market is served by its San Francisco-based Crown Newsprint Sales organization. Every one of its papermakers has visited a pressroom. Machine crews are responsible for quality and determine if finished paper can be shipped. As customers have demanded better print quality and a more uniform sheet, the mill has responded in several ways. No. 1 news machine wet end was converted to a Valmet SymFormer R configuration last year. No. 2 will be converted to a Beloit Bel Baie III wet end by mid-1987. Runability of Crown Forest's newsprint has improved to the point that customers often report 300,000 offset impressions without a washup.

To improve sheet uniformity, more testing is done to quantify formation on a numerical basis. Either the NUI or PAPRICAN formation testers are used. Technobright color meters are used for shade control, and more testing is also done offline for brightness. All three newsprint machines are equipped with cross-direction controls to reduce basis weight, moisture, and caliper variation. In addition, No. 5 is one of a few machines equipped with both cross-direction basis weight and reel hardness control supplied by AccuRay.

Through mid-1987 the newsprint market continues to remain firm, and Elk Falls' production is essentially sold out. Sharkey admits that the company has done preliminary studies for a new newsprint machine, but he won't say what factors might determine if that project gets the go-ahead. Crown Forest management will be closely analyzing the recent spate of new newsprint machine rumors and announcements to determine their plans. ■



A typical day's production for No. 5 would be in excess of 600 metric tpd.

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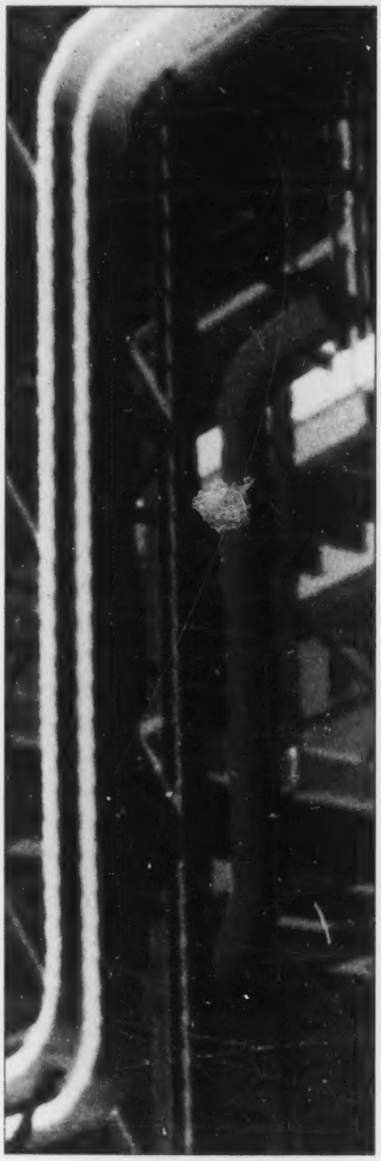

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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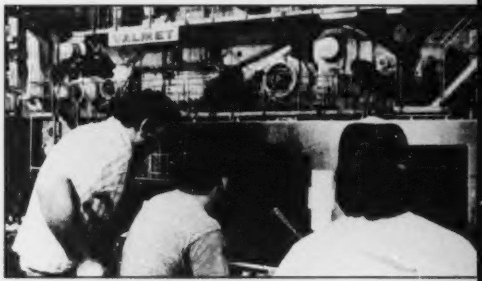

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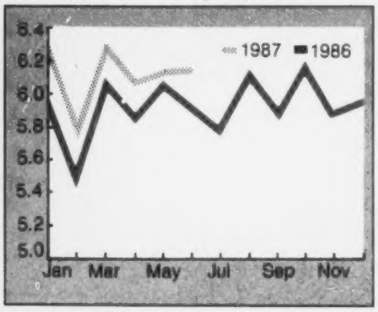
U.S. paper and board production



U.S. production of paper and paperboard totaled 6.1 million tons in June, an increase of 4.1% from a year earlier, according to American Paper Institute data. Production through the first half of 1987 held steady at record-high rates, API reported. The seasonally adjusted rate averaged 72.5 million tpy for the first six months, up 4.2% from June 1986 and 2.3% higher than the 1986 total. Paperboard continued to exhibit the most strength, with production through June 5.2% above the year-earlier rate.

Among major grades, record fiber box demand continued to fuel growth in containerboard, as kraft linerboard climbed 6.0% and semichemical medium 5.6% from last year. Coated paper production jumped 9.7% in response to strong demand from commercial printers and book publishing. Improved business in commercial printing and office copy paper helped offset new capacity additions in uncoated free-sheet, which rose 3.4% in June.

Canadian newsprint shipments in the first half were up 6.6% compared with 1986, while woodpulp exports gained 3.7%. Newsprint mills operated at 97% of capacity in June, fueling a 6.3% increase in June shipments. Woodpulp shipments jumped 12.8% for the month, with mills operating at 98%. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	June	490	5.8	5,717	2.4
Uncoated groundwood (s)	June	121	−1.6	1,527	1.5
Coated paper (s)	June	569	12.9	6,631	9.7
Uncoated free sheet (s)	June	903	3.0	10,658	3.4
Other printing/writing	June	109	−12.8	1,376	1.0
Total packaging and other paper (s)	June	409	−1.9	5,110	−0.6
Tissue	June	438	4.5	5,213	2.1
Total paper	**June**	**3,038**	**3.8**	**36,232**	**3.2**
Unbleached kraft paperboard	June	1,588	5.3	18,472	5.6
Semichemical medium	June	466	3.1	5,604	5.6
Bleached paperboard	June	347	0.0	4,405	3.1
Recycled paperboard	June	709	5.7	8,549	5.3
Total paperboard	**June**	**3,110**	**4.4**	**37,030**	**5.2**
Total U.S. paper and paperboard output	**June**	**6,149**	**4.1**	**73,262**	**4.2**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	May	4,875	2.2	58,740	3.7
Market pulp production	May	636	2.1	7,812	6.3
Wastepaper consumption at paper/board mills	May	1,500	4.0	17,361	3.7
Pulpwood consumption (cords)	May	7,582	1.1	93,350	2.7
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	June	25.620	9.0	147.204[6]	4.5
Containerboard inventories at U.S. box plants and mills	June 1	2,383	−0.5		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	May	1,024	2.8	12,394	10.0
Imports of Canadian newsprint	May	737	1.4	8,681[6]	5.9
U.S. paper exports (including products)	May	402	−1.5	4,996	7.2
Exports of unbleached kraft linerboard	May	164	−6.3	2,174	8.7
Exports of woodpulp	May	377	3.3	4,599	3.8
Norscan pulp inventories[4]	June 30	795	−17.2		
Norscan pulp operating rates[4]	June	100%	93%	100%	96%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	June	857	6.3	4,841[6]	6.6
Operating rates	June	97%	94%	98%	93%
Inventories held by U.S. consumers	June 30	1,392	1.9		
Other paper/board shipments	June	524	7.6	3,169	6.4
Woodpulp shipments (export only)	June	767	12.8	3,983	3.7
Operating rates	June	98%	92%	97%	90%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

UNCOATED GROUNDWOOD: Prices paddle slowly upstream as demand rises

Grade structure: Uncoated groundwood papers can be considered value-added newsprint—the physical properties have been enhanced by superior brightness and smoothness. At the higher end of the spectrum, supercalendering adds a finish that allows these papers to compete with lightweight coated (LWC) groundwood papers in the marketplace. Typically, brightness levels range from 64 to 72 Elrepho compared with 56 to 62 for standard newsprint. Major end uses include Sunday magazines, preprinted inserts, catalogs, directories, and forms. Basis weights range from 20 to 45 lb/3,300 ft^2.

Production/capacity: U.S. shipments of uncoated groundwood papers rose a meager 0.5% to 1.523 million short tons in 1986. Canadian shipments, on the other hand, rose to 1.225 million metric (1.357 million short) tons in 1986, a healthy 18.0% increase over 1985, according to the Canadian Pulp & Paper Assn.

These figures may not be entirely accurate, since U.S. government definitions of uncoated groundwood and newsprint for tariff purposes include, for example, rotonews in newsprint. Canadian production and shipments of groundwood specialties in 1986 probably hit at least 1.8 million metric tons, and maybe even rose above 2 million tons.

Canadian producers are expected to increase uncoated groundwood capacity by 10.8% between 1986 and 1987, according to CPPA figures, while the American Paper Institute shows U.S. capacity dropping by almost 3.0%, reflecting shutdown of some capacity at one of Great Northern Paper Co.'s Maine mills. Canadian capacity is expected to rise another 3.9% in 1988, and U.S. capacity will increase 6.5% that year. Projects in Canada include machine conversions by Abitibi-Price at its Kenogami and Alma mills in Quebec.

Outlook: The remainder of 1987 should prove generally upbeat for uncoated groundwood mills.

Production from several new coated groundwood paper machines caused prices for LWC grades to decline in 1986 and through the first half of 1987. This put pressure on the uncoated groundwood market, particularly prices for premium supercalendered (SC) grades. Coated groundwood prices have recently begun to firm, although overcapacity in LWC grades could persist into 1988. If this occurs, then premium uncoated groundwood grades could feel pressure from the startup of new SC machines at St. Marys Paper in Sault Ste. Marie, Ont., and Lake Superior Paper Industries in Duluth, Minn.

Competitive pricing and improved quality encouraged some uncoated groundwood buyers to switch to coated papers, especially in catalog, insert, supplement, and cents-off-coupon printer markets.

While some market share may have been lost to coated grades, uncoated groundwood demand is being helped by a narrowing of the usual price gap between newsprint and supercalendered paper. This has caused some shifting from newsprint to SC paper in commercial printing applications, such as inserts and catalogs.

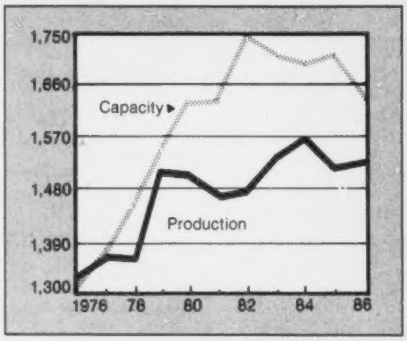
With demand projected to rise 1.8% and capacity declining, U.S. uncoated groundwood mills may achieve close to a 98% operating rate in 1987, following about 94% in 1986 and 89% in 1985.

Imports of uncoated groundwood paper into the U.S. from outside North America (mainly SC grades) are expected to remain at a fairly high level, despite the decline of the dollar. Some new lightly pigmented grades, which are positioned between SC and LWC, have begun to enter the U.S. market from European mills.

Prices: A price increase July 1 helped push up SC prices, and increases on directory, rotonews, and offset also took effect bringing prices to about 1986 levels.

List prices for 34-lb supercalendered ($/short tons) are: 1983, $638; 1984, $708; 1985, $780; 1986, $735; and midyear 1987, $710. Prices for 35-lb offset, 65 brightness are: 1985, $544; 1986, $537; midyear 1987, $595. For 30-lb standard rotonews: 1985, $510; 1986, $493; midyear 1987, $553. For 15-lb, 65 brightness forms: 1985, $518; 1986, $520; and midyear 1987, $660.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1985	1986	1987e
Production[1]	1,516	1,523	1,548
Capacity	1,710r	1,621	1,573
Utilization rate	88.7r	94.0	98.4
Imports	1,027	1,028	1,159
Exports	37	41	48
Apparent U.S. consumption	2,506	2,510	2,659
lb/capita	20.93	20.77	21.88
GNP ratio	1.40	1.37	1.41

e = estimate.
r = revised.

[1] American Paper Institute.

[2] 000 tons/$billion real GNP (1982).

TOP U.S. PRODUCERS *(000 tpy)*

Company	Annual capacity U.S.	Annual capacity Canada	Total	Market share (%)
1. CIP	—	425	425	12.2
2. Abitibi-Price	—	405	405	11.6
3. MacBlo	—	400	400	11.5
4. ConBath	—	375	375	10.8
5. Boise	40	300	340	9.8
6. GNN	270[1]	—	270	7.7
7. Champion	200	—	200	6.3
8. Madison	200	—	200	5.7
9. Domtar	—	190	190	5.5
10. James River	155	—	155	4.4

Market share of top five companies:
55.9%

Market share of top ten companies:
85.5%

North American capacity (1987):
3.484e million short tons[2]
U.S.: **1,573** Canada: **1.911e**

[1] Not including an additional 130,000 tpy groundwood swing capacity coated/uncoated.

[2] *Pulp & Paper* estimate, higher than official Canadian figures.

SALES & EARNINGS

U.S. profits still on a roll with 71% rise

The U.S. paper industry is continuing to enjoy a strong profit recovery, with second-quarter earnings up 71% on increased sales of 15.8% compared with the same period of 1986, according to a *P&P* survey of results from 30 companies. This follows a near doubling of profits in first quarter 1987.

Among the strongest second-quarter performers were companies with major exposure to linerboard, market pulp, and newsprint, where prices have been rising due to strong demand and the weak dollar. Margins of printing and writing paper producers have been under pressure from price discounting caused by overcapacity, but increases have been announced on a number of grades for the third quarter. Squeezed the hardest have been many nonintegrated paper and board mills that have been hurt by rising market pulp and wastepaper costs.

TABLE 1: **U.S. paper industry results for second quarter 1987.**

	($000) Second quarter			
Companies	**Sales**	**Change 1987/86**	**Earnings[1]**	**Change 1987/86**
Boise Cascade	$935,960	0.02%	$35,230	12.4%
Bowater Inc.	297,952	31.5	16,752	−0.07
Champion Intl.	1,161,015	5.9	59,910[2]	18.7
Chesapeake	175,045	13.3	7,137	140.1
Consolidated	177,448	7.4	19,128	−23.2
Federal Paper	240,990	13.9	8,574[2]	13.9
Fort Howard	472,543	19.9	48,351	3.4
Georgia-Pacific	2,095,000	8.6	111,000[2]	29.1
P. H. Glatfelter	102,026	39.3	14,203	31.5
GN Nekoosa	575,100	14.5	44,900[2]	n.m.
International Paper	1,910,000	55.3	90,000	18.4
James River (4/26)	1,191,363	71.7	45,817	98.9
Jefferson Smurfit	270,565	13.6	19,945	196.0
Kimberly-Clark	1,224,400	12.6	83,800	21.5
Longview (4/30)	140,731	22.6	15,405	114.8
Louisiana-Pacific	488,800	24.0	34,800[2]	42.0
Mead Corp.	1,078	40.3	51,900	40.7
Mosinee Paper	53,378	−37.4	1,131	−37.4
Pentair Inc.	196,324	46.8	2,946	−22.0
Pope & Talbot	106,288	39.6	7,211	99.0
Potlatch Corp.	243,918	−2.4	22,317	14.9
Scott Paper	1,029,400	24.1	58,800	4.4
Sonoco Products	342,718	38.8	18,434	19.8
Stone Container	830,900	57.4	32,500	828.6
Temple-Inland	395,100	26.0	35,800	85.5
Union Camp	577,567	15.7	47,812	67.2
Wausau (5/31)	63,777	10.5	2,901	−12.5
Westvaco (1/31)	461,145	5.8	24,299	30.3
Weyerhaeuser	1,769,114	18.2	89,183	30.4
Willamette	352,350	13.7	27,777	43.6
Total	**$17,881,995**	**15.8 %**	**$1,077,960**	**71.0%**

n.m. = Not meaningful.

[1] Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.

[2] **Champion International:** 1987 quarter excludes net gain of $95.8 million due to sale of certain investments and adjustment of a reserve. **Federal Paper Board:** 1987 quarter excludes $8.3 million charge from early redemption of debentures. **Georgia-Pacific:** 1987 quarter excludes a net gain for $37 million from sale of Georgia Gulf Corp. and includes a pretax gain of $6 million from redemption of stock. **Great Northern Nekoosa:** 1986 quarter includes a net charge of $21.2 million for restructuring operations. **Louisiana-Pacific:** 1986 quarter includes pretax gain of $4 million from sale of a sawmill and investment writedowns.

Sales at International Paper Co. were up 55% while earnings rose 18%. John A. Georges, chairman and CEO, attributed the improvement to low worldwide inventories for pulp and containerboard, an improving market for coated paper, and stabilization in the uncoated white paper market due to the "near absorption of recent capacity expansions." The income improvement came despite the cost of starting up two large paper machines at Pine Bluff, Ark., and Selma, Ala., and production shortfalls caused by strikes at four of its mills.

James River Corp. ended its fiscal year on Apr. 26 with earnings up 78% compared with the previous year on sales of $4.48 billion. Despite competitive pricing, the company's towel and tissue business showed a 25% improvement over last year. The income from the Dixie products business more than doubled. The company noted that income from both recycled and bleached board was "substantially" below the prior year due to difficulty in implementing price increases and rising wastepaper costs.

Champion International Corp. enjoyed a 59% improvement in net income during the first half. Chairman and CEO Andrew C. Sigler noted that the strength of the pulp business and the pickup in newsprint prices, coupled with recent turnarounds in uncoated free-sheet and publication papers, point to a promising second half.

Pulp makers are coining money. Weyerhaeuser Co.'s profits were up 61.5% for the first half, thanks to improving pulp, containerboard, and newsprint markets. World pulp inventories are at their lowest level since 1980, noted George H. Weyerhaeuser, president and CEO. Georgia-Pacific Corp. enjoyed a 97% increase in profits during the first half, which it attributed to "continued healthy demand for most forest products and improved productivity." The operating profits for the pulp and paper group reached an all-time high of $88 million during the quarter. Louisiana-Pacific Corp.'s second-quarter earnings set a new company record and were 42% higher than year-earlier levels.

Burnell R. Roberts, chairman and CEO of Mead Inc., foresees no slowdown at all in the industry's momentum during the second half. The company enjoyed a 41% increase in earnings on a similar increase in sales. Roberts noted that world inventories of pulp have been 15% to 20% below normal levels for the past year and Mead's pulp mills are sold out through the third quarter. Mead's containerboard remains sold out, and its coated board mills have been running full-out.

Paperboard profits healthy. Containerboard producers reported sharp profit gains, thanks to healthy market conditions and, in some cases, recent acquisitions. Stone Container Corp. reported that its first-half profits of $58.7 million were higher than the company's previous annual earnings record of $35.4 million set just during the last year. "As demand remains strong and further price increases occur, we should see substantial improvements in the second half of 1987 over the fine results we have already achieved," explained Roger W. Stone, chairman, president, and CEO.

Temple-Inland Inc.'s earnings rose 85% due to strong demand and rising prices for paperboard and corrugated boxes. In addition, the results were helped by last year's acquisition of the Orange, Texas, linerboard mill and improved performance from the Ontario, Calif., recycled liner mill.

Federal Paper Board Co. Inc. reported 13.9% increases in both sales and earnings for the quarter. The company's three recycled paperboard mills found their profitability curtailed by higher wastepaper costs. The company's Riegelwood, N.C., mill, which produces bleached market pulp and bleached board, set new production records during the quarter. The company's three recycled paperboard mills found their profitability curtailed by higher wastepaper costs.

Tissue producers hold their own. Despite rising raw material costs, tissue producers enjoyed modest profits during the quarter. Fort Howard Corp. resumed its profit growth with a small increase in second-quarter results, as the integration of the company's tissue and cup business began to pay off. During the quarter, its newest tissue machine at the Savannah River mill in Rincon, Ga., set company production records before its July dedication.

Scott Paper Co.'s quarterly sales exceeded $1 billion for the first time in the company's history. Income from the sanitary tissue business rose slightly, despite higher than usual manufacturing costs and the disruption caused by a flood in Maine. Sales from S.D. Warren Co.'s printing and publishing paper business increased 18% to a new record for the second quarter, but the flood and discounting on lightweight coated paper kept earnings flat.

Coated paper producers lag. Producers of coated paper generally had a less profitable second quarter than other segments but are hopeful their third-quarter price hike will help them regain some ground. Coated paper demand is strong, and substantially less capacity seems to be available than the market had anticipated.

Bowater Inc. said that all of its businesses, except for coated paper, showed improvement over second-quarter 1986. The company's earnings were equivalent with the year-earlier quarter. Consolidated Papers Inc. saw profits decline 23%, which it largely attributed to price reductions in lightweight coated paper. Pentair Inc. experienced a 22% erosion in profits due largely to the rising cost of market pulp. Mosinee Paper Corp. also attributed its 37% decline in profits to the cost of market pulp. Mosinee is spending $800,000 to expand the capacity of its Sorg Paper Co.'s deinked pulp mill in order to lessen Sorg's dependence upon market pulp. ■

Canadian profits rose 82.4%, spending plans abound

Second-quarter earnings for Canada's paper and forest products industry rose 82.4% on increased sales of 13.6%. Newsprint and pulp producers continued to enjoy strong demand, and the July 1 price increase on newsprint, as well as the third-quarter price hike on market pulp going to Europe and Japan, will ensure a profitable second half. Many companies said they would spend their profits on upgrading facilities. Second-quarter gains were partially offset by a lower exchange premium on U.S. dollar sales and the 15% export tax on softwood lumber to the U.S.

The C$135 million that MacMillan Bloedel Ltd. earned in first-half 1987 surpassed its entire 1986 profits. Ray Smith, president and CEO, emphasized that this level of profits means MB can spend money to upgrade its facilities. Smith said major factors that contributed to the results were strong markets for all its products, favorable currency fluctuations, and

TABLE 2: **Canadian paper industry results for second quarter 1987.**

	Second-quarter 1987 ($000)			
Companies	**Sales**	**Change 1987/86**	**Earnings**[1]	**Change 1987/86**
Abitibi-Price	C$756,400	7.8%	C$36,200	27.0%
B.C. Forest	344,100	6.1	32,400	62.0
Canfor Corp.	314,400	8.9	26,600	137.5
Cascades Inc.	135,240	2.0	7,592	−8.3
Consolidated-Bathurst	533,600	11.3	43,300	173.9
Crown Forest	256,000	5.3	22,800	117.1
Domtar Inc.	657,000	14.5	44,000	37.5
Donohue Inc.	133,100	16.3	10,000	138.1
Great Lakes FP	183,150	11.3	20,452	302.0
MacMillan Bloedel	806,800	15.5	74,600	51.9
Noranda	1,110,000	14.1	54,100	87.2
Paperboard Ind. (2/28)	21,657	17.7	980	94.4
Repap	237,000	97.5	12,100	548.1
Rolland Inc.	97,000	18.1	2,608[2]	38.5
Scott Paper Ltd.	73,045	13.0	3,611	9.5
West Fraser Timber	111,400	14.1	11,900	19.0
Total	**C$5,809,892**	**13.6%**	**$403,243**	**82.4%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. Rolland: 1987 earnings include C$1.6-million pretax gain from sales of property.

production of more value-added products. Smith expects the good markets to continue through the end of the year, but he noted "we are still playing catch-up after the empty-pockets period of the recession. We need to produce a consistently higher return on invested capital and spend huge sums to modernize our plants."

Abitibi-Price Inc., the world's largest newsprint producer, experienced a 16% improvement in first-half earnings on increased sales of 15%. Bernd K. Koken, chairman and CEO, said the company benefited primarily from stronger markets as well as higher prices for newsprint. He also noted that distribution operations made a "considerably greater contribution, while building products and converted products also posted gains." The third-quarter earnings will benefit from the fact that Abitibi managed to settle a three-year contract with the Canadian Paperworkers Union at its mills in eastern Canada without any strikes. "Even with a 75-cent dollar, earnings for the full year should comfortably surpass those of 1986," Koken predicted.

On the labor front, Consolidated-Bathurst Inc. was not so lucky. Three of its newsprint mills in Quebec were on strike from June 26 to July 8. But offsetting this loss were improved profits from newsprint and bleached kraft pulp, which contributed to a 74% increase in second-quarter earnings. In the company's packaging products sector, Europa Carton of Fed. Rep. Germany and CB Pak Inc. saw profits decline due to a "cost-price squeeze in most product lines."

Domtar Inc. enjoyed a 37.5% earnings increase, which it attributed to higher pulp prices and strong demand for newsprint and groundwood specialties. The fine papers group didn't fare as well due to the high price of pulp. The company also reported that its lumber business suffered from the 15% export duty. Domtar's packaging group raised its profits thanks to increased shipments and selling prices for containerboard.

British Columbia Forest Products Ltd.'s first-half earnings rose 162% over first-half 1986. Strong demand for newsprint and kraft pulp was again the major reason for the good showing. Sales volumes of coated paper from BCFP's Blandin Paper Co. subsidiary improved, but prices were weaker. The company is doing well enough to announce three major capital improvements: a C$33-million expansion of pulp capacity at its Crofton, B.C., mill, a US$350-million upgrade of Blandin, and a C$212-million newsprint and sawmill project in Mackenzie, B.C.

Canfor Corp.'s first-half profits rose 253% thanks to the rising pulp price and the fact that the company's three pulp mills were running full-out. The second half should show an even greater improvement because last year during that period earnings were curtailed by the International Woodworkers Assn. strike. Canfor said additional capital spending will be undertaken to improve operations.

Paperboard Industries Corp. enjoyed a 94% improvement in earnings in the second quarter. In the third quarter, the company bought 98.2% of the shares of Belkin Inc., making it one of Canada's largest packaging firms (*P&P*, July, p. 25). Both companies are integrated manufacturers of recycled linerboard and boxboard. Paperboard now needs more containerboard at its box plants than it has capacity to produce, and Belkin's mills can make up the difference. ■

EXPANSION/MODERNIZATION

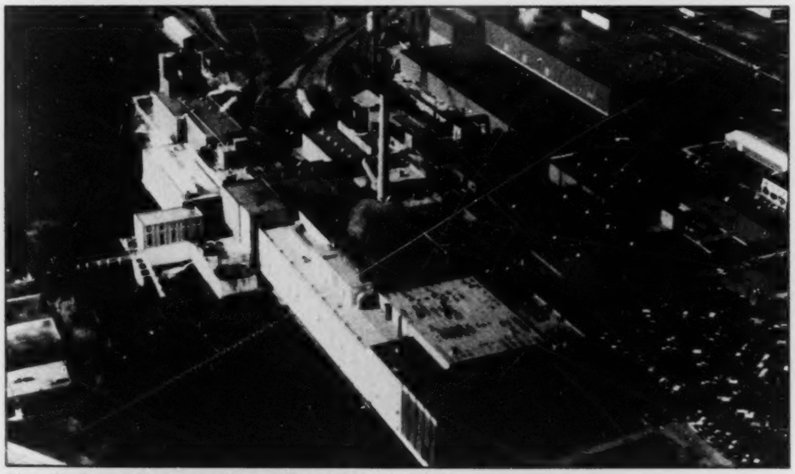
Blandin goes ahead with 254,000-tpy LWC unit

Blandin Paper Co., a subsidiary of British Columbia Forest Products Ltd., will proceed with construction of a 254,000-short-tpy lightweight coated groundwood paper machine at its Grand Rapids, Minn., mill. The project, currently budgeted at US$344 million, is due to come onstream in December 1989. A Blandin spokesman said the 79% increase in total mill capacity from the current level of 280,000 tpy to about 501,000 tpy will make the company the fourth largest producer of LWC in North America and the largest single site for coated groundwood production in the world. The 37,000-tpy No. 1 machine will be shut down.

The modernization also includes updating the groundwood pulp mill and building a new woodroom. Blandin currently is using hand-fed grinders. Modernization here is expected to help cut overall labor hours by about 40%. In addition, there will be 45 fewer jobs at the paper mill when No. 1 machine, built in 1901, is shut down. The increased consumption of pulpwood will result in the addition of 115 new logging jobs in the region.

Major construction is scheduled to begin in the fall. Company spokesman Ed Zabinsky said the machine will have a 306-in. trim and a design speed of 4,000 fpm.

The expansion is made possible by Fletcher Challenge Ltd.'s purchase of 48% of BCFP last year, which included the purchase of C$119 million in treasury shares from the Canadian company. This capital infusion as well as improved earnings in the last six months have enabled BCFP to reduce its debt load enough to undertake the long-discussed Blandin project. Plans for the new machine were



Blandin Paper Co. operation in Grand Rapids, Minn.

NSSC pulping: specialties strike again

Following a strong year in production, chemical products utilized by neutral sulfite semichemical (NSSC) manufacturers experienced strong growth in terms of tons consumed. Special blends of sodium sulfite and related liquor components fared especially well, as mills chose prepared solutions over those produced via the sulfur burning and the internal makeup process.

NSSC pulp is the principal furnish for semichemical medium, accounting for over 84% of the 5.3 million tons produced in 1986. This is shaping up to be another good year, with production increases year-to-date up 6.2%. Capacity stands at 15,745 tpd and is predicted to grow an average of 1%/year to 1990. (All previous data is courtesy of API.) Worldwide production of semichemical pulp has followed a similar pattern.

Consumption of chemicals used in the pulping process for semichemical pulps has tracked production. Sodium sulfite blends have been a chief benefactor. Sodium carbonate consumption also rose, but not as significantly. Sulfur used in all sulfite production has either remained flat or declined over the past several years.

Mills are using more packaged products from suppliers, like the Neutrapulp product line offered by Koppers Inc. The Neutrapulp products are customized for individual processes and shipped in many forms. Koppers dominates the sodium sulfite market with over two-thirds of U.S. capacity. Upgrades of its plants in Petrolia, Pa., and Tuscaloosa, Ala., (purchased from Reichhold in 1984) have expanded its products across all grades. Four other companies operate plants (two in the East, two in the West). The demand forecast calls for reasonable growth, along with production of semichemical and chemithermomechanical pulp (CTMP), where the prospects are particularly interesting. Sodium sulfite additions in mechanical pulping have increased in strength, lending that furnish to a whole new set of paper grade applications.

Exports of sodium sulfite have doubled recently, primarily due to Pacific Rim demand. Japan, and other countries where wood costs are high, uses sodium sulfite with anthraquinone and other chemicals to increase yield, reduce odors and reduce bleaching costs.

Sodium carbonate consumption is steady. Strong markets in glass containers and decreases in supply have helped soda ash in the past two years, but growth in pulp manufacturing contributes only slightly to the total (use stands at 7% of produced soda ash). Six companies supply ash, five operating plants in Green River, Wyo. Kerr-McGee has decided to complete the shutdown of its Westend, Calif., facility next year.

Chemical	Paper industry consumption 1986	% change 1987	Price ($) 1987	% change 1988
Sodium sulfite	111,940	6.5%	24/hundred weight	10%
Sodium carbonate	784,500	1.5%	80/ton	5%
Sulfur	55,000	0%	130/metric ton	0%

Source: *Chemical Marketing Reporter.*

Sulfur use has declined due to the curtailed use of sulfur burners and liquor makeup processes. Because of high operational costs linked to efficiency problems, economics have dictated that the use of purchased product returns easier than an internal process. Burners remain in use where economical, but many are subsidized by purchased product. Equipment suppliers are offering modern burning systems that have low maintenance and can operate via computer control.

PRICE. NSSC and sulfite manufacturers may be subject to price increases soon for many of these chemicals. The cost of sodium sulfite will rise due to the skyrocketing cost of caustic. Sodium carbonate prices have been lackluster for many years, until recently when an increase was forced. Now prices should strengthen again from supply reductions and steady demand. Sulfur, too, is getting some relief for the same reasons, and revised long-term reports on worldwide supply favor North American producers.

—*Michael Ducey*

Correction. Our column published in July was in error when it reported the consumption of sodium chlorate in chemical pulp mills. The correct figures should be 422,000 tons for the U.S. and 240,000 tons for Canada. These figures represent a 3% growth over 1985, and this year should follow this trend. *P&P* wishes to thank Kemanord for its help in correcting this mistake.

MAINTENANCE SURVEY SHOWS EMPHASIS ON PREVENTIVE TECHNIQUES CONTINUES

Southern U.S. mills are leading the way in maintenance force productivity, use of outside contractors, and preventing downtime

By KENNETH E. SMITH, Executive Editor

For the second year in a row, *Pulp & Paper* conducted a survey of maintenance practices in the North American pulp and paper industry. Questionnaires were mailed to approximately 1,000 plant and maintenance engineers in the U.S. and Canada whose names were taken from *P&P*'s Pulp & Paper Industry Personnel Census list. Responses received this year represent a total of 74 mills. (See *P&P*'s September 1986 issue, p. 60 for complete details of the 1986 survey.) Mills responding to the survey produce all major grades of pulp and paper. Annual production capacities range from 6,000 to 1 million tons. Survey data have been tabulated and are presented by region in Table 1. The five regions presented are the U.S. Northeast, Midwest, South, West, and Canada. All figures given are short tons. Table 2 is an interpretation of the survey data and also shows data from last year's survey.

Southern mills responding to the survey average the largest production capacity at 463,786 tpy (Table 1, Section A). Canadian mills report the most recent paper machine modernizations, on average, in 1984. Northeastern mills are both the smallest, with an average production capacity of 162,122 tpy, and the least modern, with their most recent paper machine modernization in 1976, on average.

All Canadian and northeastern mills are unionized (Table 1, Section B). Logically, fewer Canadian mills—only 27%—report flexicraft or multicraft work rules in their maintenance departments, and in only 9% of all Canadian mills can operators perform any maintenance. Southern mills report the most flexible labor rules with only 64% unionization, 85% of mills with flexicraft or multicraft maintenance, and 57% of mills where operators can perform some maintenance. Southern mills report the fewest maintenance job classifications with an average of 6, while Canadian mills are tops in this category with an average of 12. Greater use of flexicraft or multicraft maintenance staffing has required southern mills to provide more training for maintenance workers. Mechanics at these mills are trained an average of 64 hours/year, while electrical and instrument (E&I) people receive 94 hours/year. Canadian workers are the least trained with 13 and 39 hours/year for mechanics and E&I people, respectively.

More flexible work rules apparently allow southern mills to lead all others in contract maintenance utilization (Table 1, Section C). These mills report an average of 20% of their maintenance budgets are spent on contract maintenance. Canadian mills are last in this category with an average of only 12%.

Predictably, more flexible work rules and larger mill size allow southern mills to be the most productive in terms of tpy/maintenance employee (2,899), while the northeastern mills are the least productive at 1,386 tpy/maintenance employee (Table 2). Western mills are the most productive in terms of maintenance manhours per ton of production at 0.62, with southern mills a close second at 0.71. Northeastern mills are also the least productive in this category at 1.54.

MAINTENANCE EFFECTIVENESS. Despite their strict work rules, Canadian mills proved to be very effective in their preventive maintenance programs. Canadian mills report an average of only 4% of all downtime caused by equipment failure (Table 1, Section D). Western mills were high in this category at 14%. Canadian mills also led the way in fewest unplanned maintenance jobs at 24%. Midwestern mills were also high at 49%. Unplanned maintenance was determined by asking the percentage of all maintenance jobs begun the same day as initiated. These jobs are assumed to be breakdown related or emergency situations. Southern and western mills also came out well in this category, both reporting an average of 27% unplanned maintenance jobs. In addition, these two regions reported the most frequent use of maintenance planners to assist maintenance supervisors at 93% and 69%, respectively.

Southern and western mills reported the highest average paper machine availability, with both regions at 94% (respondents were asked to base availability on 365 days/year). Canadian and northeastern mills reported the lowest average availability at 91%, probably due to more restrictive labor contracts.

TABLE 1: **Maintenance survey data summary.**

	Northeast	Midwest	South	West	Canada
A) Mill data					
Mills responding	16	16	14	13	11
Production, tpy (short tons)	162,122	167,900	463,786	351,450	274,455
Last paper machine modernization	1976	1980	1979	1980	1984
Total employees	639	652	672	532	767
Total maintenance employees	17	119	160	138	200
Total maintenance mechanics	73	75	123	112	159
Total E & I personnel	25	22	33	27	40
Total maintenance supervisors	10	9	14	12	16
Maintenance manhours/year	250,040	198,420	328,436	219,500	300,937
Percent overtime manhours/year	12%	15%	11%	11%	7%
Maintenance budget as percent of mill operating budget	9%	18%	26%	15%	13%
Capital maintenance as a percent of total maintenance budget	11%	11%	10%	10%	9%
Days/year of mill operations	353	344	359	362	355
B) Maintenance Work force					
Mills with unionized maintenance forces	100%	88%	64%	92%	100%
Mills with flexicraft or multicraft work rules	63%	50%	85%	62%	27%
Average number of maintenance job classifications	7	9	6	8	12
Mills where operators can perform some maintenance	27%	40%	57%	50%	9%
Average hours/year training for each mechanic	26	49	64	35	13
Average hours/year training for each E & I person	56	93	94	71	39
C) Outside contractors					
Percent maintenance budget spent on outside contractors	16%	14%	20%	15%	12%
Percent contractors work to capital maintenance	69%	63%	57%	62%	59%
Mills planning to increase outside contractor use in 1988	27%	33%	44%	11%	50%
D) Maintenance effectiveness					
Paper machine availability	91%	92%	94%	94%	91%
Pulp mill availability	92%	93%	95%	96%	92%
Paper mill equipment efficiency	84%	85%	91%	86%	87%
Percent downtime due to equipment failure	11%	8%	12%	14%	4%
Mills that analyze downtime causes	53%	50%	83%	67%	73%
Mills conducting maintenance force productivity evaluations	44%	44%	50%	58%	30%
Percent maintenance jobs that are unplanned	29%	49%	27%	27%	24%
Mills with planners assisting maintenance supervisors	50%	57%	93%	69%	64%
Mills where maintenance department is involved in planning expansions/modernizations	75%	60%	71%	85%	91%
E) Preventive maintenance					
Mills with "scheduled" preventive maintenance program	75%	56%	100%	69%	100%
Percent of maintenance budget to preventive maintenance	10%	13%	16%	14%	11%
Average number of full-time maintenance inspectors	3	2	7	3	4
Mills with permanently installed conditioning monitoring	21%	13%	43%	31%	27%
Unplanned downtime reduction attributed to preventive maintenance	17%	27%	32%	24%	23%
F) Computer-assisted maintenance					
Mills with computerized work order systems	63%	50%	100%	69%	73%
Mills with computerized spare parts ordering/inventory system	56%	69%	100%	69%	91%
Mills with computerized downtime analysis	25%	25%	36%	8%	36%
G) Equipment and stores					
Average number of electric motors in mill	1,454	1,780	1,760	2,020	1,655
Average number of electric motors in stores	263	196	286	490	376
Average number of electric motors replaced each year	95	145	99	159	95
Average number of paper machine dryer bearings in mill	313	304	264	395	390
Average number paper machine bearings replaced each year	10	12	14	10	22
Average number of rotary joints in mill	80	154	159	155	165
Average number of rotary joints replaced each year	27	102	50	48	51

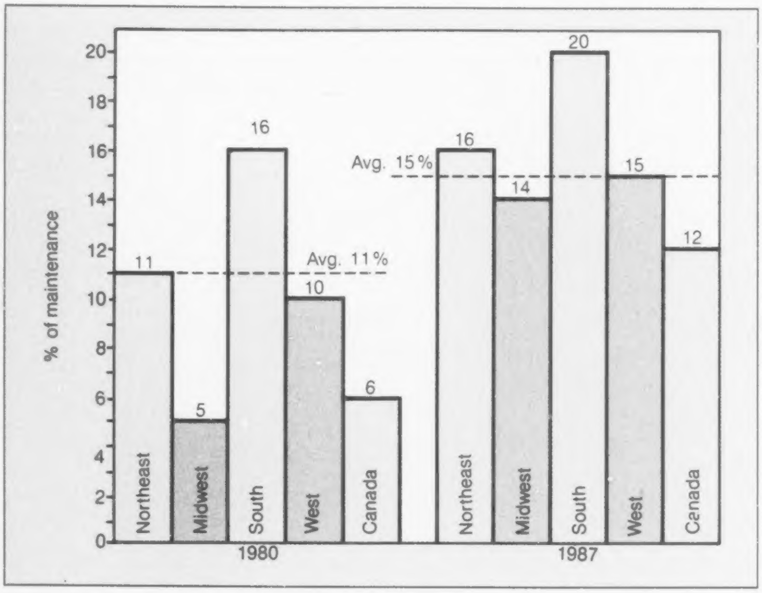


FIGURE 1: **Maintenance contractor utilization.**

TABLE 2: **Survey data evaluation (1986/87).**

	Northeast	Midwest	South	West	Canada
Production tpy/maintenance employee					
1986	1,127	2,532	2,012	2,199	1,203
1987	1,386	1,411	2,899	2,547	1,372
Percent maintenance employees/total employees					
1986	21%	19%	23%	27%	26%
1987	18%	18%	24%	26%	26%
Maintenance supervisors/100 mechanics					
1986	15	10	11	10	13
1987	14	12	11	11	10
Maintenance manhours/ton of production					
1986	1.37	0.69	0.94	0.76	1.58
1987	1.54	1.18	0.71	0.62	1.10
Average percent electric motors replaced each year					
1987	7%	8%	6%	8%	6%
Average percent dryer bearings replaced each year					
1987	3%	4%	5%	3%	6%
Average percent rotary joints replaced each year					
1987	34%	66%	31%	31%	31%

Respondents were asked to report Equipment Efficiency, which is based on the following formula:

Equipment Efficiency = % Availability x Quality,
where
Quality = Prime Tons/Prime Tons + Reject Tons.

Southern and Canadian mills came out on top in this category at 91% and 87%, respectively. Despite their contrast in work practices and mill size, these mills also reported the most effective use of preventive maintenance (Table 1, Section E), each having a regularly scheduled preventive maintenance program in place. Southern and Canadian mills also led the pack in the use of computers to handle work orders and for spare parts inventory and ordering (Table 1, Section F). They also led all others in the use of computer analysis of downtime; however, only 36% of these mills have taken their preventive maintenance programs to this step.

Southern mills attribute an average 32% reduction in unplanned downtime to their preventive maintenance programs. These mills report an average of seven full-time preventive maintenance inspectors, and 43% have permanently installed condition monitoring systems. Southern mills lead all others in amount of money spent on preventive maintenance, reporting an average of 16% of their maintenance budgets going for preventive maintenance. Midwestern mills were the least likely to have a preventive maintenance program (56%).

FIGURE 2: **Tonnage responsibility of maintenance employees.**

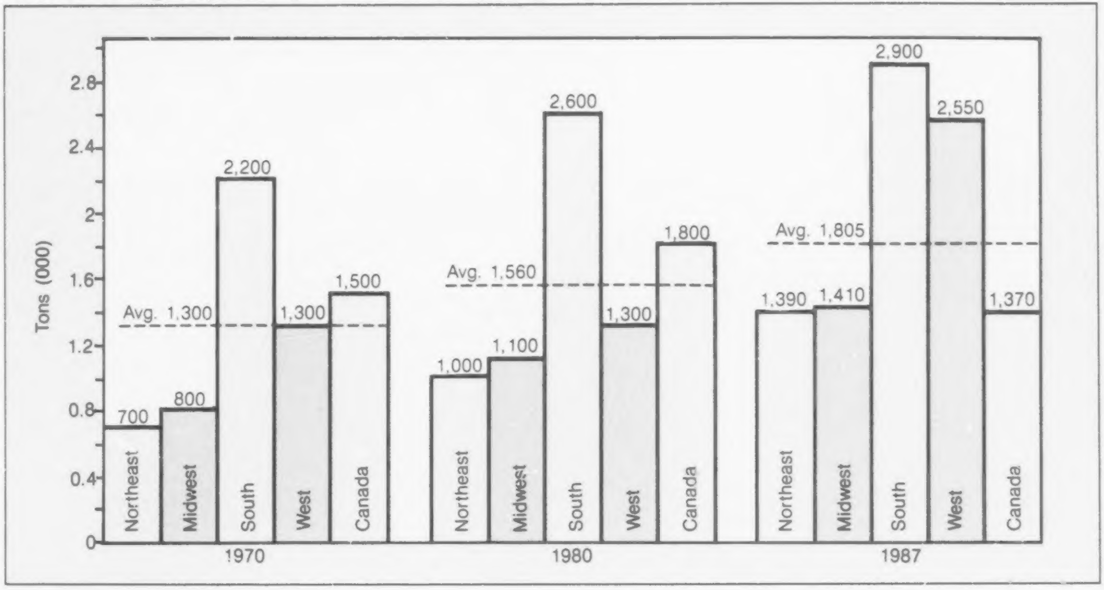
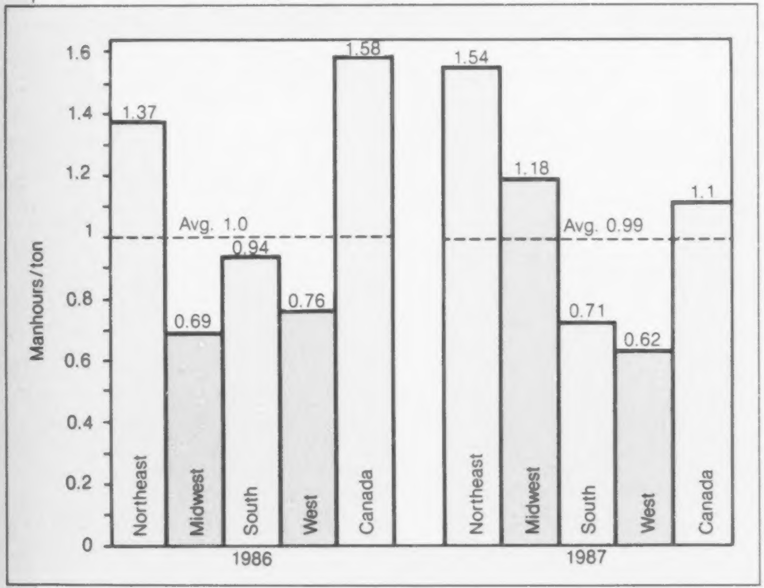


FIGURE 3: **Maintenance productivity.**



Probably because of their effective preventive maintenance programs, southern and Canadian mills replaced the fewest (6%) of their electric motors and rotary joints each year (Table 2). However, these mills replaced the most paper machine dryer section bearings (5% and 6%, respectively). It has been said that mills with preventive maintenance vibration monitoring programs will replace more bearings than those mills without such programs with the benefit of reduced unplanned downtime. These statistics seem to prove that theory.

Respondents were asked what modern preventive maintenance methods they use. Systematic vibration monitoring proved to be the most popular. In Canada, 100% of the mills use this technique, and in the South 93% use it. The second most popular technique, infrared temperature measurement of electrical connections, is used by 100% of Canadian respondents, 100% of the western mills surveyed, and 79% of southern mills. Other popular techniques include spectrometric oil analysis, ultrasonic testing of materials, and infrared temperature measurement of other equipment. Metal spraying has apparently been tried by a number of mills with less than satisfactory results, according to survey respondents.

COMPARISON WITH PREVIOUS SURVEYS.

Prior to 1986 and 1987, *P&P* conducted one other maintenance survey in 1980. Comparison of survey results shows a few trends in North American maintenance practices. In 1980, mills reported an average of 11% of their maintenance budgets was spent on outside contractors (Figure 1). In 1986 that average jumped to 14% for all regions, and in 1987 it rose again to 15%. As previously stated, southern mills led the way, spending an average of 20% of their maintenance budgets on contractors. Some 44% of southern mills say they plan to increase spending on outside contractors in 1988, so this trend seems likely to continue.

In 1980, the average tonnage responsibility for each maintenance employee was 1,560. In 1986 that figure rose to 1,815, and this year that figure was 1,805. It is unclear whether maintenance productivity will continue to rise. As production processes are automated, maintenance workers are becoming an increasingly larger portion of the overall mill work force. This year maintenance workers averaged 21% of all workers over all regions. In some Swedish mills, such as Svenska Cellulosa AB's Östrand mill, this figure reaches as high as 40%. Fifteen years ago, maintenance workers were about 25% of the work force in a typical Swedish mill. Today that figure is closer to 31%. As North American mills become more sophisticated in their preventive maintenance programs, the percentage of maintenance workers is likely to continue to rise.

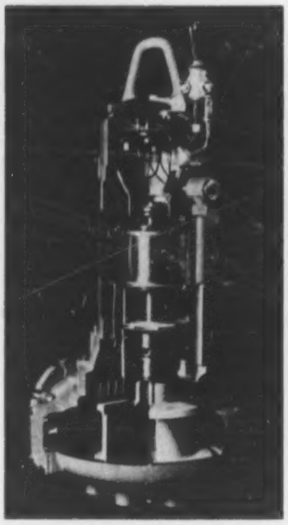
One figure that has stayed fairly constant is the number of supervisors per 100 mechanics. In 1980, it was 11.4. In 1986, it was 11.8, and in 1987 it averaged 11.2.

CONCLUSION. Southern mills, due to the economies of scale and their more flexible labor relations, excel in almost every category of maintenance productivity in this survey. They have gone far in implementing preventive maintenance programs—as have the Canadian mills. However, preventive maintenance is not cheap. Southern mills report that an average of 26% of their mill operating budgets is charged to the maintenance department! As previously stated, southern mills report an average of 16% of the maintenance budget devoted to preventive maintenance programs. Obviously, for many of these mills that operate 365 days/year, unscheduled downtime is far more expensive.

One respondent wrote that he is forced to ignore survey results due to the wide variation in the definition of terms such as "unplanned downtime," "availability," and even "maintenance workers." He said that "apples don't taste like oranges." Unfortunately, this is true, and a comparison of your mill's numbers with these survey results may be difficult. However, it is likely that mill maintenance will become more sophisticated in its techniques and, therefore, more expensive. Maintenance managers will be challenged to continue to reduce unplanned downtime with preventive maintenance programs, while trying to check rising maintenance costs. The editors of *Pulp &Paper* welcome your input in trying to make this survey more meaningful. ■

Maintenance force productivity, preventive maintenance techniques, and the use of outside contractors will be the focus of presentations at Pulp And Paper Maintenance '87, *a two-and-a-half-day conference sponsored by* Pulp & Paper *and* PBI Maintenance Inc. *to be held in Atlanta, Ga., Nov. 9-11, 1987. For more details, see p. 286 in this issue.*

The Davis/EMU challenge... can your pump meet or beat it?



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PULP & PAPER

October 1987

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FINISHING/CONVERTING:
Latest trends in equipment,
operating strategy

EXPANSION/MODERNIZATION:
Startup of Seminole Kraft **89**
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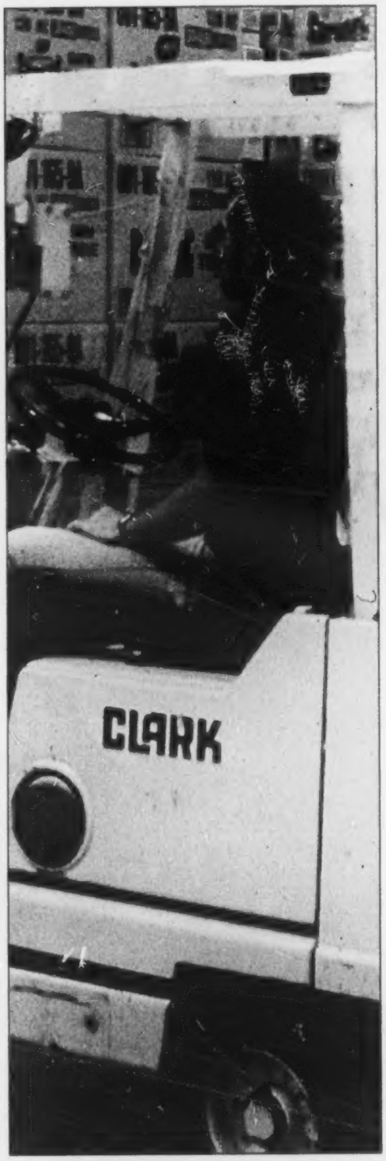

THE COVER

***Among the latest trends found in finishing/converting, the highlight of this issue, is the use of mobile computer terminals, mounted on warehouse vehicles or hand held, for real-time inventory tracking and improved converting operations. The story on these systems begins on p. 100.* (Photo courtesy of LXE, a division of Electromagnetic Sciences Inc., Norcross, Ga.)**

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PULP & PAPER

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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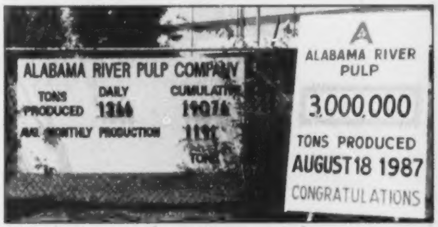

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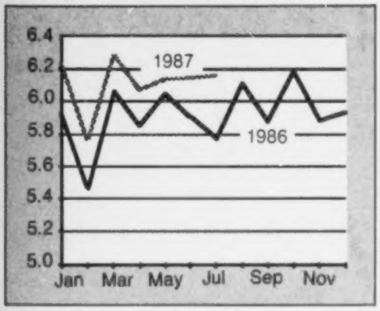
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.2 million tons in July, up 6.8% from the same month last year, according to the American Paper Institute. The sharp increase is due in part to more flexible work rules that allowed mills to take less downtime this July than in previous years. As the accompanying chart shows, production actually rose slightly in July 1987 from the previous month, breaking the traditional pattern evident in the 1986 data. After taking these changes into account, API calculates that the seasonally adjusted trend rate was 73.1 million tpy for the month, up 4.6% from the year-earlier rate.

Among major grades, the paperboard sector continues to outperform paper. Containerboard production for domestic use was up a solid 7.1% compared with 1986, as fiber box shipments continued at record levels. Coated paper, up 10.7%, has posted the largest year-to-year percentage increases recently because of weakness last year caused by customer inventory imbalances.

Canadian newsprint shipments totaled 779,000 tons in July, up 2.8 from 1986. Woodpulp shipments of 652,000 tons were off 5.0%, however. Operating rates for the month stood at 92% for newsprint and 99% for pulp. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
***PAPER & PAPERBOARD PRODUCTION*[1]**					
Newsprint	July	502	5.2	5,760	2.8
Uncoated groundwood (s)	July	123	-3.9	1,520	0.6
Coated paper (s)	July	563	16.3	6,649	10.7
Uncoated free sheet (s)	July	915	4.7	10,703	3.7
Other printing/writing	July	101	-5.6	1,354	-1.9
Total packaging and other paper (s)	July	389	-6.7	5,046	-1.4
Tissue	July	432	9.4	5,196	2.7
Total paper	**July**	**3,025**	**5.0**	**36,227**	**3.5**
Unbleached kraft paperboard	July	1,632	13.5	18,606	6.6
Semichemical medium	July	471	6.8	5,610	5.8
Bleached paperboard	July	372	-1.3	4,414	2.4
Recycled paperboard	July	665	4.4	8,462	5.0
Total paperboard	**July**	**3,140**	**8.5**	**37,092**	**5.6**
Total U.S. paper and paperboard output	**July**	**6,165**	**6.8**	**73,319**	**4.5**
***PULP, WASTEPAPER & FIBER*[2]**					
Total U.S. woodpulp production	June	4,977	2.7	58,985	3.7
Market pulp production	June	693	8.1	7,899	6.7
Wastepaper consumption at paper/board mills	June	1,474	6.5	17,415	4.2
Pulpwood consumption (cords)	June	7,723	2.1	93,238	2.6
***CONVERTED PRODUCTS STATISTICS*[3]**					
Corrugated box shipments (billion ft²)	July	25.341	5.8	172.403[6]	4.6
Containerboard inventories at U.S. box plants and mills	July 1	2,396	3.3		
***INTERNATIONAL TRADE*[2]**					
U.S. paper imports (including products)	June	1,043	16.3	12,415	11.0
Imports of Canadian newsprint	June	741	14.5	8,716[6]	7.3
U.S. paper exports (including products)	June	484	28.4	5,133	10.7
Exports of unbleached kraft linerboard	June	221	38.1	2,253	13.4
Exports of woodpulp	June	455	22.3	4,742	6.9
Norscan pulp inventories[4]	July 31	960	-7.8		
Norscan pulp operating rates[4]	July	105%	100%	93%	98%
CANADIAN STATISTICS*[5] *(reported in metric tons)					
Total newsprint shipments	July	779	2.8	5,620[6]	6.1
Operating rates	July	92%	96%	97%	93%
Inventories held by U.S. consumers	July 31	1,461	3.6		
Other paper/board shipments	July	518	5.1	3,684	6.3
Woodpulp shipments (export only)	July	652	-5.0	4,631	2.3
Operating rates	July	99%	100%	97%	91%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

PAPER-GRADE CHEMICAL MARKET PULP: Pulp bandwagon should continue through 1988

Grade structure: Chemical paper-grade market pulp is sold in the open market and does not include captive pulp used onsite or shipped to affiliated mills within North America. Pulp is divided into grades based on whether it is made from softwood or hardwood fiber, whether it is produced by the sulfate (kraft) or sulfite pulping process, and whether it is bleached, semibleached or unbleached.

Northern bleached softwood kraft (NBSK) is the premium pulp grade because of its long fiber length and strength, although papermakers have been making more use of southern pine and hardwoods. Market pulp is sold in sheets, flash-dried bales, or rolls.

U.S. chemical paper pulp statistics include about 1.7 million tons of fluff pulp production (including exports) used in diapers and other absorbent hygiene products. Dissolving and chemical pulp grades are excluded from the statistics.

Production/capacity: North American market pulp producers are enjoying a strong recovery this year, thanks to the declining U.S. dollar, continued growth in demand, and limited capacity expansion. The weak dollar has made pulp price increases over the past two years easier for buyers in Europe and Japan to accept, and it has improved the cost competitivness of U.S. and Canadian producers vs competitors in Scandinavia.

Chemical paper-grade market pulp production this year is expected to be up about 7.5% in the U.S. to 6.1 million metric tons and up 10% in Canada to 7.3 million tons. Producer inventories in North American and Nordic countries hit a seven-year low of 795,000 tons and are expected to end the year at about 1.0 million tons or less.

Consumer inventories are reported to be at moderate levels—538,000 tons at the end of June in the U.S., up only 1.7% from a year ago.

Future outlook: Canadian and U.S. mills are expected to run near full capacity again in 1988, with continued growth in demand and limited capacity expansion. This is based on the consensus estimate of about 2.8% growth in the U.S. economy next year. Historically, pulp prices have tended to lag turning points in the economy by a couple of years.

The only major new market pulp project announced for North America is Champion International Corp.'s plan to double the size of its Hinton, Alta., softwood mill to 424,000 tpy by late 1989 (which may be partly offset by a new paper machine at its Quinnesec, Mich., pulp mill). In addition, Daishowa Paper of Japan is studying a possible 340,000-tpy hardwood pulp mill for northern Alberta.

One possible supply-side concern is about 1.0 million tons of bleached chemi-thermomechanical market pulp, which will be coming onstream in Canada over the 1986-88 period. Meanwhile, the growing use of superabsorbents has reduced U.S. fluff pulp consumption in baby diapers by an estimated 150,000 tons in the past year.

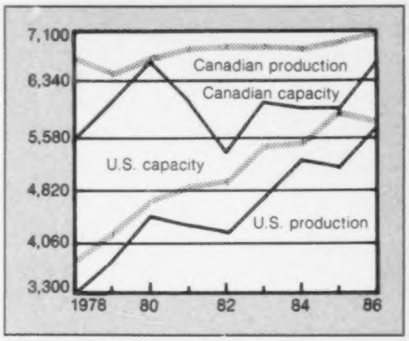
Such "thin" diapers have already captured 50% of the U.S. market and and may hit 90% in a couple of years. This would further reduce fluff pulp use since superabsorbent diapers contain about 30% less fluff on a unit basis.

Several major eucalyptus pulp expansions are planned in Brazil for the early 1990s. The most definite is Aracruz Celulose SA's plan to more than double capacity to 1 million tons.

Pricing: Pulp prices have risen practically each quarter since the end of 1985. The benchmark price of NBSK in Europe has risen from a low $390/metric ton in late 1985 to $635 by the fourth quarter of 1987. Prices may rise again in the first quarter or second quarter of 1988. Such a scenario would depend on continuing weakness in the dollar and healthy paper demand which would permit pulp buyers to pass through their costs.

Year-end U.S. market prices ($/metric tons delivered) for NBSK: 1980, $530; 1981, $530/$565; 1982, $440; 1983, $450; 1984, $510; 1985, $390; 1986, $480/$520; 1987, $610. (For further details, see *P&P PriceBook 2.*)

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

U.S.	**1985**	**1986**	**1987e**
Production[1]	5,093	5,718	6,145
Capacity	5,923	5,758	6,192r
Utilization rate	86.0	99.4	99.2
Imports	2,296	2,498	2,445
Exports	2,828	3,405	3,490
Apparent U.S. consumption	4,561	4,811	5,100
Canada	**1985**	**1986**	**1987e**
Production[1]	5,968	6,600	7,260
Capacity	6,929	7,151	7,265
Utilization rate	86.1	92.3	99.9

e = estimate.
r = revised.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	**Market share (%)**
1. Weyco[1,2,3,5,6]	1,200	8.9
2. G-P[1,2,5,6]	670	5.0
3. IP[1,6]	650	4.8
4. Canfor[1,3,4]	620	4.6
5. P & W[1,2,a]	590	4.4
6. GLFP[1,2,3]	585	4.3
7. Repap[1,3,4]	520	3.9
8. MacBlo[1,3,4]	480	3.6
9. BCFP[1,3,4]	480	3.6
10. Leaf River[1,2,3]	450	3.3

Market share of top five companies:
27.7%

Market share of top ten companies:
46.4%

Total North American capacity (1987):
13.457 million metric tons

1. Bleached softwood kraft.
2. Bleached hardwood kraft.
3. Semibleached softwood kraft.
4. Unbleached kraft.
5. Bleached sulfite.
6. Fluff pulp.

a = Parsons & Whittemore.

strongly denied Wall Street speculation that the company itself might be for sale.

PCA said it planned to keep five folding carton plants (Grand Rapids, Mich.; Mentor, Ohio; Salt Lake City, Utah; St. Louis, Mo.; and Denver, Colo.) because they are profitable and to meet customer commitments. The plants have been increasingly using virgin boxboard grades recently and fit in closely with some of PCA's specialty plastic/aluminum food packaging operations.

Republic Gypsum reported net sales of $56.8 million and net income of $4.3 million for the fiscal year ended June 30. It is anticipated that the addition of the PCA operations would raise net sales by about 150%. ■

Plastic inroads in milk cartons slow

Paperboard Packaging Council reports that its campaign to promote the use of paperboard milk cartons as opposed to plastic bottles has reversed the long-term decline forecast for solid bleached sulfate (SBS) cartons.

The PPC has been promoting SBS cartons since 1983, asserting that paperboard cartons protect milk from vitamin-damaging light better than plastic containers. The campaign is to run through 1988. A spokesman for the PPC said the paperboard industry is not experiencing a loss of 15,000 to 20,000 tpy in board consumption that was initially forecast when plastic milk bottles came on the scene.

U.S. Dept. of Agriculture statistics bear out PPC's claim. While plastic bottles accounted for nearly 98.4% of 1-gal milk container sales in 1985, paperboard containers held their own in the smaller sizes. Between 1983 and 1985, sales of half-gal paperboard milk cartons slipped 5.4%—nowhere near the 50% loss some were predicting. Sales of SBS quart containers remained unchanged during the period. Paperboard containers control close to 100% of milk sales in the pint, half-pint, one-third-quart, and 10-oz container sizes because making smaller paper cartons is more economical than making small plastic bottles.

A few years ago, there were rumors that supermarkets would try to make pricing of small volumes of milk more equitable with large sizes, which would help the cause of SBS cartons. So far, however, there appears to be little indication that this has happened. It seems that SBS producers have time on their side. As the Baby Boom generation ages and the population in the U.S. gets older, people will probably prefer to buy smaller volumes of milk.

Improving printability. All five major milk carton producers in the U.S. (Champion International Corp., IP, Potlatch Corp., Westvaco, and Weyerhaeuser Co.) have gone to considerable effort and expense to improve the strength, smoothness, and printability of their liquid packaging board. A spokesman for Potlatch said the driving force behind these upgrades is the desire to halt the erosion of market share lost to plastics. Milk cartons provide a low-cost alternative to plastic and offer printing and graphic advantages that plastic does not have. "Paperboard producers are regaining market share because converters can use four-color, flexographic, and lithographic printing on the packages so that they just jump off the shelf," he said.

This summer Weyerhaeuser Co. started up its newly rebuilt liquid packaging board machine at its Longview, Wash., mill. The mill now has capacity for over 200,000 tpy of milk carton stock. The rebuilt machine makes a stronger, smoother multi-ply board called StructurePak for use in milk and juice cartons. The company believes the board is of sufficient quality to be used in the packaging of fastfood.

Meanwhile, it has been reported that Champion has stopped making its TasteSaver liquid packaging board, which it introduced in January 1985. The board was designed to keep juices fresher without a foil layer by using a polypropylene coating in addition to a polyethylene coating. The company continues to produce its DairyPak milk and juice cartons, which use over 80% of the 705 tpd of bleached paperboard made at its Canton, N.C., mill. ■

Fluid milk sales by package size and type.*

Container size	Total sales (million lb)	Type of container Glass	 Paper (% of total sales)	 Plastic
Gallon	2,158	—	1.6%	98.4%
Three-quart	9.4	—	—	100.0
Half-gallon	801	1.3	81.5	17.1
Quart	174	1.4	97.2	1.4
Pint	59	—	99.0	1.0
Half-pint	328	—	99.4	0.6

*Sales for 1985 by handlers regulated in Federal Milk order markets.
(—) Figures less than 0.1%.
Source: U.S. Dept. of Agriculture.

ENVIRONMENT/ENERGY

Dioxin discharge limits may be imposed

A joint study conducted by the Environmental Protection Agency and the American Paper Institute due to be released next month reveals that some paper mills discharge dioxin. Dioxin has been shown to be toxic to laboratory animals, but the long-term effects of dioxin on people have not been fully documented. It is possible that the EPA may impose discharge limits on dioxin this year.

The joint study, 75% funded by API and 25% by EPA, monitored the discharge of five paper mills: James River Corp., Wauna, Ore.; Boise Cascade Corp., International Falls, Minn.; International Paper Co., Jay, Maine; Mead Corp., Chillicothe, Ohio; and Champion International Corp., Lufkin, Texas. The EPA's preliminary report indicates that discharges from at least three of the five paper mills contain up to 100 parts per quadrillion of dioxin.

All of the mills produce either bleached or semibleached kraft pulp. The chlorine in the bleached kraft pulping process is believed to generate dioxin.

About 85 mills in the U.S. use the kraft bleaching process, according to Red Cavaney, president of the API. This represents about 20% of the

Kraft pulping: shifts away from saltcake continue

COOKING. Makeup chemicals for kraft pulping liquor are changing. The use of saltcake is decreasing as mills seek to ease operations by employing caustic, sodium hydrosulfide and elemental sulfur for their makeup needs. These chemicals have been the benefactors of production during the last few years, with consumption rates rising for each. Even with strong prices and ample supply, use of these chemicals will follow production while saltcake use will remain flat or (probably) decline.

Kraft pulp production in the U.S. and Canada will set new records again in 1987. This segment of the industry is running about 4% over 1986. Mills have very high operating rates. No large capacity increases (new mills, etc.) are scheduled and the incremental increases undertaken recently have been absorbed without any significant threat to the market. North American capacity of chemical pulp should grow about 1% per year through 1990.

Saltcake use is down. Mills are seeking ways to curtail processing of liquor, such as dissolving and other handling procedures. Sensitivity in storage, corrosion concerns, and cost of processing (capital and production) are the reasons for moving toward site-ready material. Delivered liquids are the trend of today. The emulsified sulfur business has grown substantially over the past two years, as have sodium hydrosulfide and sulfate/sulfite mixtures from industries producing it as a byproduct (such as sodium hydrosulfite generation). Caustic consumption in kraft pulping is climbing alongside these compounds. Systems using these chemicals can place delivery equipment close to the digester and meter material on demand. Other companies are said to be interested in supplying emulsified sulfur, but the industry leader will continue to be Chemical Enterprises, Houston, Texas.

Price changes have occurred. Caustic products across the board have risen a tremendous 30% in 1987. Sulfur prices are slumping, but this will not have an effect on slurries because of the tightness of availability and the production cost factor in manufacturing product. Sodium hydrosulfide and saltcake prices are unpredictable due to the site-specific nature of sources and their customers.

Should the price of caustic continue its upward spiral, new light may be cast on the use of soda ash as the sodium source. Another applied technology to watch is the expansion of chlorine dioxide generators from which spent acid and saltcake are produced. More interest in systems that curtail saltcake production is evident, making consumption of prepared liquids grow faster.

Chemical	P&P Consumption 1986	% change 1987	Price 1987	% change 1987
Sodium sulfate	500,000	0.2%	$50/ton	−25%
Sodium hydrosulfide	22,800	6%	$500/ton	0%
Caustic	2,000,000	6%	$195/ton	30%
Lime	1,200,000	8%	$50/ton	−15%
Defoamers	26,000	12%	$1/lb	4%

Use of defoamers in brownstock washing is strong. There are relatively few new equipment installations (such as the Ultrawasher and Chemiwasher), and most systems are already operating above design capacity. Anthraquinone, modified cooking, and other kraft pulping enhancing techniques have caught on in Japan and Europe but have yet to achieve any real success in North America.

RECOVERY. Lime consumption traditionally follows production very closely. Most mills can recover 90% or more of the total consumed. Makeup is needed for process losses including escape, upsets and spillage. Oxygen is also used as a crutch for mills seeking temporary additional kiln capacity.

Purchased lime from the industry in 1986 was up 8% and this year will prove similar. This figure includes all areas of consumption such as recovery, water treatment, and a recent strong segment—precipitated calcium carbonate generation. There are many lime producers in the U.S., with Dravo Lime Co. operating three of the top ten facilities.

No new consumption patterns are apparent in recovery. Suppliers do not anticipate any significant changes in price or availability in the foreseeable future.

— Michael Ducey

RECORD U.S. PAPER PRODUCTION SPURS STRONG DEMAND FOR WASTEPAPER

Paperstock market should remain stable for the rest of 1987, but mandatory recycling programs could flood market in the long term

By REGINA M. McGRATH, News Editor

The U.S. wastepaper market heated up quickly during the first quarter, with prices increasing on most grades. Although the market was less frenzied in the second quarter, prices and demand remained strong. The prognosis for the second half is clouded by unpredictable currency fluctuations, but most market observers do not expect to see any major decline in prices for any of the paperstock grades for at least the rest of 1987.

The record production year the U.S. pulp and paper industry is currently enjoying is the main reason for rising wastepaper prices. Containerboard mills are running full-out and tissue mills are running in the high 90's. Offshore demand, particularly for old corrugated containers, was strong during most of the first half but began to ease in July.

Rising wastepaper prices was the main reason cited by recycled boxboard producers when they instituted their first-half price hike. Producers of recycled tissue have been unable to raise prices on roll products, but this might occur early next year.

TABLE 1: **1986 wastepaper data (short tons).**

	Consumption at U.S. paper and paperboard mills*	Exports	Total collected
News	3,143,011	766,087	3,909,098
Corrugated	8,682,115	1,529,772	10,211,837
Mixed	2,028,129	693,697	2,721,826
High grades	4,034,488	759,205	4,793,693
Total	**17,887,743**	**3,748,711**	**21,636,454**

1985 wastepaper data

	Consumption at U.S. paper and paperboard mills*	Exports	Total collected
News	3,174,989	625,631	3,800,620
Corrugated	7,899,441	1,310,876	9,210,317
Mixed	1,901,502	879,825	2,781,327
High grades	3,874,123	469,594	4,343,717
Total	**16,850,055**	**3,285,926**	**20,135,981**

* Includes consumption at plants making molded pulp and insulation products.
Source: American Paper Institute.

PRICE TRENDS SO FAR THIS YEAR. The unbleached grades showed the biggest price increases during the first half. The price of old corrugated containers in the New York City area rose about $20 between January and July to between $70 and $80/short ton. The price for new double-lined kraft corrugated clippings also rose by about the same amount.

In the bulk grades, the price for old newsprint increased between $5 and $10 during the half to between $45 and $50/ton nationwide. Mixed paper prices didn't show as much movement as the other bulk grades, although prices in some regions of the country rose $5/ton.

Pulp substitute prices were a matter of debate during much of the first half and remain a question mark in the second half. During May, many wastepaper dealers were predicting a $10 to $20 drop in price, but this never materialized when July rolled around. Some dealers even suggested that prices could rise in the fourth quarter, particularly if pulp prices in the U.S. rise again.

Demand for deinking stock has been the most consistent of all the paperstock grades. The price of manifold colored ledger rose at least $10/ton nationwide during the first half. In July, deinking prices jumped because Kimberly-Clark Corp. began buying heavily.

RECOVERY. The recyclable recovery rate has been on an upward trend overall for the past two decades, with some minor setbacks along the way. It has hovered at about 26% since 1980, but broke that barrier in 1986 when the rate reached 28%. This was due to a 13.3% rise in exports and a 7.4% increase in the amount of recyclable paper recovered.

The American Paper Institute reports that total collections of old newspapers in 1986 reached 3.9 million short tons, a 4% increase over 1985. Collections of old corrugated containers totaled 10.2 million short tons last year—a 10.8% increase over 1985. Collections of mixed papers totaled 2.7 million short tons in 1986, a drop of 4.7% from 1985. This is mainly due to export customers buying more OCC and news because mixed paper shipments are becoming more contaminated with plastics, metals, and other nonfibrous materials.

Total collection of high grades of deinking stocks and pulp substitutes in 1986 was 4.8 million short tons, up 8.5% from the previous year. This reflected the increasing yield of clippings from factories making paper products such as envelopes, business forms, and printed brochures. Demand for the high grades was good also, due to mills shifting more fiber furnish over to secondary fiber from woodpulp.

FUTURE DEMAND. The wastepaper market in the U.S. is divided into four regions: the New York area, the Midwest, the Southeast, and the West Coast. Right now, the best place to be a wastepaper dealer is the Southeast. Two new waste-based machines are expected to come onstream there in the next two years.

Southeast Paper Manufacturing Co. is building a 210,000-tpy recycled newsprint machine at its mill in Dublin, Ga. Plus, Fort Howard Corp. will start up the second recycled tissue machine at its Rincon, Ga., mill next year. The first machine started up in April and has capacity for about 250 to 400 tpd of tissue, depending on the product being made. The third machine is slated to come online in 1990 and the fourth in 1992.

Georgia cannot generate enough wastepaper to supply Southeast Paper and the second Fort Howard unit, let alone the two Fort Howard machines that will start up in the next decade. This could spur increased paper collection in Florida and neighboring states and is definitely causing the price of wastepaper in that region to rise.

WEAK DOLLAR HELPS EXPORTS. The U.S. is the world's largest exporter of wastepaper. In 1986, U.S. exports of paperstock reached an all-time high of 3.75 million short tons. Through the first five months of 1987, exports were 13.9% ahead of the year-earlier period at 1.7 million tons. Exports are expected to exceed 4 million tons this year. The three largest consumers of U.S. paperstock in 1986 were Taiwan (891,691 tons), Rep. Korea (839,714 tons), and Mexico (564,333 tons). Together these countries accounted for 61.1% of all U.S. wastepaper exported in 1986.

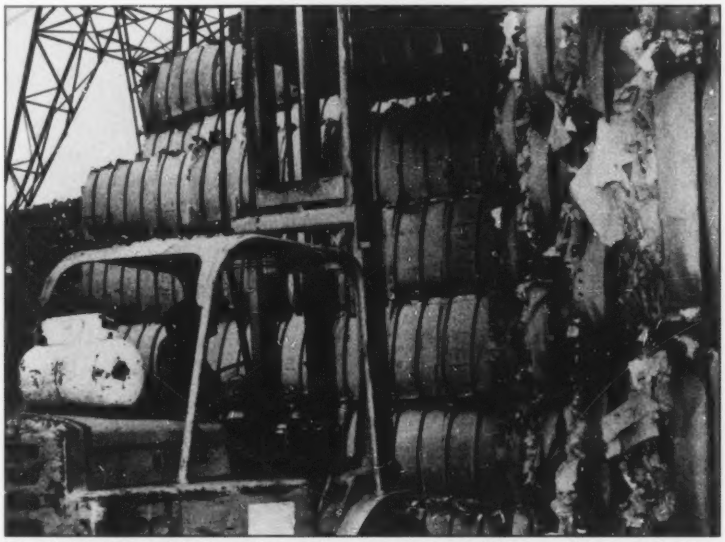
The export market for wastepaper was quite strong during most of the first half but began to show weakness in July. For example, the export price of OCC from the West Coast rose about $30 between May and June to between $130 and $135/ton. But by July the price had fallen by about $10, mainly due to the fact that Korea and Taiwan had sufficient inventories and were staying out of the market.

The weak U.S. dollar has caused some aberrations in the offshore markets. In some cases it is cheaper for overseas mills to buy paperstock directly from the U.S., bypassing foreign wastepaper dealers altogether. At the end of the first half, some Far Eastern countries turned to Europe for wastepaper since some countries there were oversupplied. The West Coast is most sensitive to offshore demand, and the market there was showing more weakness than the other regions in the beginning of the second half.

FUTURE TRENDS. U.S. mills find they are facing increasing competition from overseas for certain grades of paperstock. For example, in 1980 U.S. exports of pulp substitutes amounted to 205,000 tons compared with 312,000 tons in 1986—more than a 50% increase. About 176,000 tons of deinking grades were exported in 1980 compared with 447,000 tons in 1986.

This kind of competition is exacerbated by the construction of waste-to-energy facilities in the U.S. In order to protect themselves, more primary producers are getting involved in recycling, integrating their operations fully or partially. This will also force mills to use mixed grades of paperstock since they may no longer have the luxury of buying enough of one grade.

Mills are searching for ways to make better use of computer printout (CPO) that has been contaminated with laser printing. So far, no known technology has been accepted by the industry as a viable means of eliminating the ink from laser-printed CPO. Tissue makers cannot use CPO with laser marks. The increasing use



The U.S. is the world's largest exporter of wastepaper. This year it is expected to ship over 4 million tons overseas.

of laser printers on fine paper grades makes this problem especially urgent.

LACK OF LANDFILL SPACE. The U.S. is running out of landfill space in which to put its trash. According to *Recycling Today*, the tipping fees paid by refuse haulers in the U.S. rose 13% in 1986. Prices paid to dump refuse at landfills in the Northeast average about $20/ton and amount to about $10/ton in the rest of the country. Many trash haulers would be glad to pay these prices, but the landfill in their area is full, so they are also forced to pay to have the trash transported to another landfill. In some East Coast cities, disposing of a ton of trash now costs $100.

This lack of space has caused many states to institute mandatory recycling programs. Rhode Island and New Jersey both have laws requiring separation of specific household recyclables. Massachusetts and Pennsylvania are considering similar bills, and Michigan, New York, and Delaware are studying ways of dealing with their landfill problems.

The effect of such laws on the national paperstock market is a matter of debate. Paperstock dealers are wary of mandatory recycling because the quality of recycled paper is expected to decline while the quantity will increase. The worst-case scenario can be seen in Fed. Rep. Germany, where a flood of low-grade wastepaper has caused the paperstock market to hit bottom.

On the other hand, wastepaper dealers may be able to ally themselves with the municipal governments by processing the paper waste or buying the paper collected by the city. The impact these programs will have on paperstock prices depends on whether the municipality sells its stock below market prices, gives it away, or pays for its removal.

LANDFILL ALTERNATIVES. Waste-to-energy plants account for about 8% of the total waste stream in the U.S. and 1% in Canada, according to *Recycling Today*. Of this 8%, about 20% of the waste they burn must be landfilled as ash. Of the planned waste-to-energy plants, 41.3% are in the Northeast, 22.7% are in the South, 18.7% are in the north-central region, and 17.3% are in the West, Babcock & Wilcox reports. One problem with these plants is that if paper is removed from the waste stream, it is more difficult to burn the remaining waste. Also, the Environmental Protection Agency is considering regulating the flyash from these plants as a hazardous waste. The flyash would have have to be separated and disposed of in a landfill, taking up valuable space.

Of course, Americans could always try to throw away less trash. The reverse is happening, however, because the proliferation of two-income families with more money than time causes trash generation to increase. For example, more people eat out, so the number of boxes, bags, and other fast-food containers entering the waste stream has increased. ■

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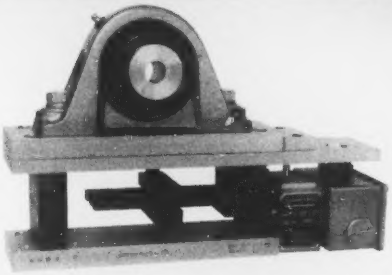

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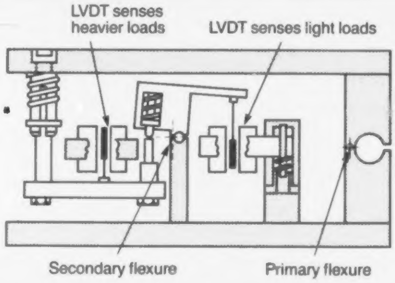

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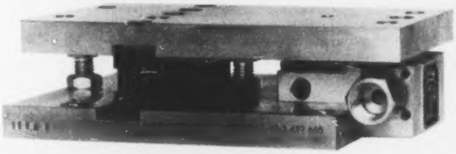

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